

BOOK OF
ABSTRACTS

EARLI 2019



**RWTHAACHEN
UNIVERSITY**

Policy Making Session 1

12 August 2019 10:30 - 11:45
Lecture Hall - H01
Policy Making Panel Session
Educational Policy and Systems

EARLI 2019 Policy Making Session

Keywords: Citizenship education, Economics of education, Educational policy, Lifelong learning

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Sanna Järvelä, University of Oulu, Finland

Education is more important than ever. Rapid development of technology and digitalisation has set in motion a huge change in the way we work. Routine tasks will be replaced with technology and automatised and robotised will be utilised at every level, and people will be assigned more and more tasks that require creativity, planning, critical thinking, and interaction and communication skills. The change of work, new jobs, tasks and competences will affect everyone. A wide reform of ongoing learning is needed. People must be able to access education or update competences multiple times through life as the economy and opportunities requires. Therefore, ongoing learning challenges the traditional route of education and traditional learning environments. Education is one of the core issues of policy in every country. The interplay between policy and educational science requires considerable joint efforts to build a common understanding of the most prevalent educational problems and their solutions. The conference theme "Thinking Tomorrow's Education: Learning from the past, in the present and for the future" push evidence-based discussion of ongoing learning forward. In this EARLI panel, the following leading questions are discussed by outstanding representatives of policy-makers and educational scientists:

How and what kind of multidisciplinary research is needed to better prepare for future work and competences? How digitalization can contribute to better education and ongoing learning solutions? How policy-making and educational science dialogue could be facilitated? What is the relevance of empirical evidence from a policy-making perspective? Whose responsibility is it to ensure that research reaches those who might use it? Should all academic research be 'useful'? What is the role EARLI can play in bridging research and policy making?

EARLI 2019 Policy Making Session

Presenting Author: Brikena Xhomaqi, LLLP, Belgium; **Presenting Author:** Jeroen Van Merriënboer, Maastricht University, Netherlands; **Presenting**

Author: Debra Myhill, University of Exeter, United Kingdom; **Presenting Author:** Daniel Muijs, Ofsted, United Kingdom

Education is more important than ever. Rapid development of technology and digitalisation has set in motion a huge change in the way we work. Routine tasks will be replaced with technology and automatised and robotised will be utilised at every level, and people will be assigned more and more tasks that require creativity, planning, critical thinking, and interaction and communication skills. The change of work, new jobs, tasks and competences will affect everyone. A wide reform of ongoing learning is needed. People must be able to access education or update competences multiple times through life as the economy and opportunities requires. Therefore, ongoing learning challenges the traditional route of education and traditional learning environments. Education is one of the core issues of policy in every country. The interplay between policy and educational science requires considerable joint efforts to build a common understanding of the most prevalent educational problems and their solutions. The conference theme "Thinking Tomorrow's Education: Learning from the past, in the present and for the future" push evidence-based discussion of ongoing learning forward. In this EARLI panel, the following leading questions are discussed by outstanding representatives of policy-makers and educational scientists:

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Session A 1

12 August 2019 12:00 - 13:30
Lecture Hall - H09
SIG Invited Symposium
Learning and Social Interaction

SIG 21: Widening participation? (Re)searching institutional pathways for marginalized groups

Keywords: Cultural diversity in school, Ethnography, Language (Foreign and second), Multicultural education, Social interaction, Student learning

Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Charles Max, University of Luxembourg, Luxembourg

Organiser: Giulia Messina Dahlberg, University of Gothenburg, Sweden

Discussant: Sylvi Vigmo, University of Gothenburg, Sweden

This symposium examines *transition processes* in education and agentic actions that play a significant role in facilitating movements beyond social, cultural and linguistic barriers. From a global perspective, education can be regarded as "the most important currency" (NMC, Horizon 2020, p. 28) emphasising the urgency to take care of "access to education for all". Granting access to education in concrete terms and beyond the policy level is one of several challenges that educational institutions are facing in times of massive migrational dynamics at a global level and a growing diversity of school populations. The issue of "access for all" is also highlighted in the global goals of Agenda 2030 for sustainable development. Here, goal 4 relates to quality and "good education for all". Openness and flexibility in institutional pathways are core elements in this process. Current research highlights that both have the potential to positively affect all students, irrespective of their identity-positions across educational trajectories (Bagga-Gupta 2017a, Bagga-Gupta, Messina Dahlberg & Winther 2017). Far from being a commonsensical and ideological outcome, openness as a metaphor points to a shift in current understandings of the *raison d'être* of education, namely a common citizenship in democratic societies that supports social mobility and equity. To analyse this topic, the contributions in the symposium specifically focus on *functionality* and/or *cultural diversity* as markers of marginalisation processes in and across educational practices. Given the paucity of scholarship that focuses upon these individuals' membership in social practices (including technology usage), and large-scale mappings, this symposium welcome empirical contributions that engage with a range of methodologies and data, from micro to macro analytical levels. The contributions, analysing institutional and agentic actions from different geopolitical contexts, will together contribute to enhanced understandings of heterogeneity that comprises marginalized groups in society.

Researching 21st century institutional trajectories.

Presenting Author: Sangeeta Bagga-Gupta, Jönköping University, Sweden

21st century mobilities across and within Northern and Southern places and spaces call for according visibility to the global circulation of discourses with the specific intent of (re)viewing conceptual "webs-of-understandings" that mark and perpetuate the continuing naturalization of North-centric hegemonies on the one hand and enabling ways of widening dialogical apertures in the Educational Sciences on the other hand. This paper offers analytical reflections vis-à-vis recent (re)discoveries of the performative dimensions of "linguaging" in North-centric places, highlighting how these conceptualizations appropriate what is "normal diversity" and "normal linguaging" in Southern places while continuing to exclude South-centric conceptual framings. It also calls attention to the compartmentalized disciplinary domains in which these discussions take place. Such theorizing can be understood as a Second Wave of Southern Perspectives that center-stages identity-diversity and linguistic-diversity across Northern and Southern places and spaces, highlighting the need to globalize dialogues within the Educational Sciences and Language Studies. Inspired by a more overarching "turn towards turns" (Bagga-Gupta 2019) in general, and a linguistic-, boundary- and decolonial-turn more specifically, this paper thus center-stages issues related to the need for destabilizing North-centric knowledge regimes and

engaging analytically with global-centric alternative epistemologies where Southern framings and scholarship are brought into conversations. Here challenges of researching children and adults' trajectories across institutional settings in the 21st century appear to be imprisoned in 20th century educational conceptual framings.

Unaccompanied asylum-seeking children' multiple transitions in Italy

Presenting Author:Alessio Surian, Università degli Studi di Padova, Italy; **Co-Author:**Diego Di Masi, University of Torino, Italy; **Co-Author:**Francesca Novella, University of Padova, Italy

The paper focuses on unaccompanied asylum-seeking youth education. It presents results concerning one case study, i.e. the reception system and specifically the educational policies in Padova, a medium-size city in the North-East of Italy. The study explores to what extent integration policies take into account an inclusive approach across diverse learning contexts in and outside of school. According to Article 24 of the Charter of Fundamental Rights of the European Union, children and young people under 18 years of age have the right to protection and care as this is necessary for their wellbeing and the children's best interests must be a primary consideration in all actions related to them. What happens when the child is an unaccompanied minor? How do public authorities and private institutions collaborate to guarantee the children' and youth's rights? It presents the results of a qualitative research based on narrative analysis of semi-structured interviews conducted with unaccompanied asylum-seeking youth, social workers, educators, foster families. It analyses how local services are dealing with unaccompanied children and youth. The main findings address practices concerning the different transitions that affect young migrant lives in relation to adulthood, education and employment, residential care, foster family care.

Encouraging Student Participation in Intercultural Classroom Interaction

Presenting Author:Karl Hedman, Jönköping University, Sweden

Background. Few empirical studies have examined practices of how teachers encourage student participation in intercultural classroom interaction in Sweden. A better understanding of this interactional problem has the potential to contribute to the development of intercultural education planning and delivery. **Aims.** The purpose of this study is to examine practices of encouraging student participation in intercultural classroom interaction. **Method.** Participant observation and observational field notes of classroom interaction will be conducted in an ethnographic fieldwork at a Swedish high school in 2019-2021. Pre-fieldwork observations have been performed in the same high school. **Preliminary Findings.** The pre-fieldwork observations demonstrate six key practices that class participants used to encourage student participation: (1) Teachers fostering active classroom participation. (2) The teacher question – student answer – teacher comment practice. (3) Teachers asking interculturally sensitive and recipient designed questions to encourage student participation. (4) Student initiatives to participate in classroom interaction. (5) Teacher and students saying a word or sentence together. (6) Teachers supporting collaboration and collaborative group and pair work. **Conclusion.** In the intercultural classrooms, teachers and student supervisors acted as mediators across cultures encouraging students to initiate narrative accounts and class participation based on their individual and intercultural experiences and competences. **Implications for practice.** The findings suggest that initiatives and support by teachers, student supervisors and peer students are necessary to support student participation in intercultural classroom interaction by enhancing student participation and supportive resources of students.

Holistic learning activities for the inclusion of marginalized youths: the case of Luxembourg

Presenting Author:Jinyoung Choi, multi-LEARN Institute, Luxembourg; **Co-Author:**Philippe Blanca, multi-LEARN Institute for Interaction and Development in Diversity, Luxembourg; **Co-Author:**Gudrun Ziegler, multi-LEARN Institute for Interaction and Development in Diversity, Luxembourg

Youths experience personality, physical, social, and emotional changes, which sometimes create difficulties in schooling. Especially, migrant youngsters, including asylum seekers and refugees, are exposed to higher chances of marginalization at school and bigger communities, mainly due to their lack of language skills and cultural knowledge, and pre- and post-migration stressors (Fazel et al., 2012; Pastoor, 2015; UNHCR, 1994). However, the current formal education system, particularly in Luxembourg, falls short of meeting their special needs and providing necessary measures for them to handle their challenges and gain more successful participation and integration. This presentation intends to give insights into how such a gap in the mainstream educational environment can be filled by project-based activities that are holistic in nature (Fien, 2001; Sterling, 2001; Lotz-Sisitka et al., 2015; Mahmoudi et al., 2012). As a case study, this presentation introduces Project LEILU – “Learning to be in the new environment – a holistic approach for youngsters in Luxembourg”, which aims to propose an alternative way of learning, development, participation and inclusion of youngsters, including asylum seekers and refugees. Based on ethnographic research and qualitative participant interviews and questionnaires, this study shows that participants of LEILU benefitted from the project in various dimensions, namely, emotional, social, spiritual and physical. It implies that a holistic and inclusive approach to learning can help marginalized groups to recognize the self and the social context of learning and develop self-confidence, and in the long run, develop as critical, confident and independent citizen in the democratic society (Thompson, 2003; Petal, 2003).

Session A 2

12 August 2019 12:00 - 13:30

Lecture Hall - H08

SIG Invited Symposium

SIG 20: Epistemic Tools for Inquiry

Keywords: Collaborative Learning, Educational technology, Inquiry learning, Learning Technologies, Technology

Interest group: SIG 20 - Inquiry Learning

Chairperson: Cindy Hmelo-Silver, Indiana University, United States

Organiser: Bram De Wever, Ghent University, Belgium

Organiser: Ingo Kollar, University of Augsburg, Germany

Organiser: Yiannis Georgiou, Cyprus University of Technology, Cyprus

Discussant: Jim Slotta, OISE, University of Toronto, Canada

Epistemic tools for inquiry support and scaffold engagement in practices of inquiry (Sandoval & Reiser, 2004). They are structures that guide and constrain inquiry (Collings & Ferguson, 1993). Such tools can accomplish this through supporting cognitive, metacognitive, and social processes that guide students towards epistemically appropriate reasoning (Barzilai & Chinn, 2018). Collectively, the papers in this proposal present new scaffolds designed to support students' inquiry and promote growth in inquiry competencies. The projects described in these papers are innovative particularly in that they develop comprehensive suites of tools designed to scaffold not just one or two reasoning skills but an integrated network of skills needed to reason successfully about complex information. These projects all develop carefully designed scaffolding suites that move beyond individual scaffolds to provide cohesive epistemic tools to support more advanced, integrative reasoning practices during inquiry.

Investigating concept-mapping in support of students' epistemic practices in outdoors inquiry

Presenting Author:Eleni Kyza, Cyprus University of Technology, Cyprus; **Co-Author:**Nicoletta Pantela, Cyprus University of Technology, Cyprus

Supporting elementary school students' epistemic practices during outdoors inquiry investigations can be a challenge, as socio-material interactions in outdoors contexts can inhibit students' self-regulation and inquiry process. Scaffolded learning with mobile devices can help counter-act some of the challenges, and help students engage in epistemic practices such as sense-making and co-construction of knowledge in the wild. Our work has explored the dynamics of outdoor learning using augmented reality enhanced mobile devices with elementary and secondary school students, engaging in problem-solving in environmental science and history contexts. In this contribution, we will use the lens of Instrumented Activity Situations model to explain the motivation behind the design and empirical investigation of a concept-mapping tool embedded in the TraceReaders Augmented Reality app. A quasi-experimental, pretest-posttest control group design was adopted; in addition, we collected and analyzed verbal and non-verbal data from two pairs of students in the concept mapping condition. The experimental group (n=12) used the TraceReaders app with an embedded concept mapping tool, while the control group (n=11), used the same learning app

without the concept mapping tool. The results showed that the experimental group students gained a deeper conceptual understanding after the visit, as evidenced by their concept maps and their discussions during their visit.

Constructive and Example-Based Scaffolds: Effects for Individual and Collaborative Science Learning

Presenting Author:Sarah Bichler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Marcia Linn, University of California-Berkeley, United States; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

We used a modeling tool to foster integrated understanding of climate change in an online inquiry learning unit with dynamic visualizations that learners either completed individually or in pairs. The modeling tool was embedded in two differently designed scaffolds, that both aim at making visible inaccurate ideas about energy flow, energy transformation, and the role of greenhouse gases and the ozone layer for global temperature. The constructive scaffold requires learners to visualize their understanding in an interactive workspace and provides them with automated feedback on their model. Learners are prompted to seek further information to revise their model in case they depicted inaccurate ideas. With the example-based scaffold learners observe how a peer constructs the model, explicitly including inaccurate ideas and their revision. Throughout the inquiry unit, learners engage in a number of epistemic activities such as making predictions, using evidence from scientific models, asking questions, explaining, revising predictions, and drawing conclusions. Preliminary results indicate that collaborative learners benefit more from the constructive than the example-based scaffold but that the opposite is the case for individual learners. We conclude that scaffolds' effectiveness in inquiry science learning is dependent on social mode of study. Learning scenarios that aim at jointly generating ideas are best designed with scaffolds that encourage interaction.

Scaffolding Inquiry with Multiple Documents: The Knowledge Society Sandbox

Presenting Author:Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Asnat R. Zohar, University of Haifa, Faculty of Education, Israel; **Co-Author:**Shiri Mor-Hagani, Haifa University, Israel; **Co-Author:**Talia Shlomi-Elooz, University of Haifa, Faculty of Education, Israel; **Co-Author:**Ruti Ben-Yishai, University of Haifa, Faculty of Education, Israel

Inquiry often requires drawing on multiple information sources or documents in order to understand phenomena or events. However, the documents that are available to learners can vary widely in their credibility, quality, and viewpoints, making it difficult to know who to trust and what to believe. We developed a suite of cognitive and metacognitive epistemic scaffolds, called the Knowledge Society Sandbox, that supports students as they evaluate, select, analyze, and integrate multiple documents. The design of the scaffolds is informed by expert practices and current theories of multiple document comprehension. At the core of the Sandbox environment is a document mapping scaffold that enables learners to visualize the network of relations between sources and claims. In a quasi-experimental study, we engaged 9th grade students in investigating a historical controversy using the Sandbox environment. Learning with the Sandbox was found to have a positive effect on learners' integrative writing and on their meta-epistemic knowledge about integration of multiple documents. Analysis of learners' discourse suggested that the Sandbox scaffolds helped learners develop new ways of thinking about multiple documents by drawing their attention to contrasting claims, relations between sources and claims, and relations of agreement and disagreement among sources. Learners succeeded using the affordances of the mapping scaffold to visually represent the controversy. However, resolution of the controversy seemed to require further support.

Scaffolding Explanations and Epistemic Development for Systems (SEEDS)

Presenting Author:Cindy Hmelo-Silver, Indiana University, United States; **Co-Author:**Joshua Danish, Indiana University, United States; **Co-Author:**Ravit Golan Duncan, Rutgers University, United States; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Zachary Ryan, University of Indiana at Bloomington, United States; **Co-Author:**Melissa Moreland, University of Indiana at Bloomington, United States; **Co-Author:**Na'ama Av-Shalom, Rutgers University, United States

The main goal of scientific inquiry is to understand natural phenomena by creating models and theories that explain them. These models are based on evidence that scientists collect through experiments, observations, and simulations. We conjecture that there are several ways that these different forms of evidence can interact. The goal of this research is help students learn to use different kinds of evidence in thinking about and creating models of complex systems. The presentation will present results from a tutoring study designed to scaffold students thinking about both complex systems and epistemic practices involving reasoning about both simulation evidence and empirical evidence. The goal is to help learners reason with systems concepts as well as them understand how strong the evidential support is, what the relationship is between different kinds of support, and how particular evidence supports or contradicts particular parts of models.

Session A 3

12 August 2019 12:00 - 13:30

Lecture Hall - H05

Symposium

Teaching and Teacher Education

Enacting agency in teacher education: Perspectives on pre-service teachers and teacher educators

Keywords: Educational technology, Higher education, Learning Technologies, Meta-analysis, Pre-service teacher education, Qualitative methods, Student learning, Teacher professional development, Workplace learning

Interest group:

Chairperson: Hege Hermansen, University of Oslo, Norway

Organiser: Mirva Heikkilä, University of Turku, Finland

Organiser: Mirjamajja Mikkilä-Erdmann, University of Turku, Finland

Discussant: Natasa Pantic, University of Edinburgh, United Kingdom

This symposium offers new insights into the crucial challenge of enacting agency in teacher education. By agency, we mean the interplay between person and practice (Edwards 2015), which is manifested in an ability to choose between options and to judge which option is the most desirable (Biesta et al. 2015) and in recognizing the possibility to intervene in and transform the meaning of activities (Mäkitalo 2016). Since the Enlightenment, education in Western societies has aimed to support people to develop their agency (Lipponen & Kumpulainen 2011). To foster pupils' agency, pre-service teachers must themselves develop a strong sense of agency (Edwards 2017). Moreover, to navigate in the organizational and epistemic complexity of teacher education, all actors must be able to respond to this complexity with a sense of agency and purpose (Goller & Paloniemi 2017; Priestley et al. 2015). Agency can thus be considered both an objective and a means for strengthening teacher education. However, agency in teacher education remains an under-researched phenomenon both theoretically and empirically from the viewpoints addressed in four presentations of the symposium. This symposium contributes to these challenges from a range of perspectives including program development and teacher professional development. Conceptually, it addresses agency in ways that seek to account for the complex realities of teacher education and its institutional embeddedness (Eteläpelto et al. 2013). Empirically, the symposium examines agency as enacted by pre-service teachers and teacher educators. The overall objective is to identify and theorize how agency can be supported within teacher education.

Research skills in action: Voices of Finnish pre-service teachers' professional agency

Presenting Author:Mirva Heikkilä, University of Turku, Finland; **Co-Author:**Tuuke Iiskala, University of Turku, Finland; **Co-Author:**Mirjamajja Mikkilä-Erdmann, University of Turku, Finland; **Co-Author:**Anu Warinowski, University of Turku, Finland

The paper responds to a recent discussion on integrating theory and practice in teacher education as well as a call to examine pre-service teachers' professional agency in different learning environments. Professional agency is defined as actively taking possession of the received instruction to develop one's expertise as a becoming teacher. The aim is to explore *what kind of professional agency is manifested in teacher education in a learning environment where the teaching practice and the research methods studies are mixed with each other*. Written texts (N=79) of first-year pre-service teachers were retrieved from their reflexive teaching practice reports in one Finnish university. In the university in case, both the teaching practice and the research methods studies begin the first term and they are combined with each other. In teaching practice, which takes place in university training schools, the students are assumed to show emerging

professional agency and apply theoretical knowledge to practice. Narrative methods were used to interpret professional agency concealed in language. The findings that can be used in program development indicate that this kind of mixed learning environment can facilitate pre-service teachers' professional agency. However, this facilitation is indirect and the students need supervision and guidance to integrate theory and practice since mistaken ideas on the purpose of the research skills restrict professional agency. Theoretically, this paper adds to the discussion of pre-service teachers' professional agency by grasping the importance of the pre-service teachers' ability to use the educational theory in practice to become agentic professionals.

Heading for the future: Building professional agency among Finnish teacher educators

Presenting Author:Päivi Hökkä, University of Jyväskylä, Finland; **Co-Author:**Katja Vähäsantanen, University of Jyväskylä, Finland

This meta-study investigated the professional agency of teacher educators and practices that promote their professional agency. Informed by a subject-centred, socio-cultural approach, we defined professional agency as the notion that teachers influence, make decisions, and negotiate regarding their work and professional identity (including their professional goals and interests). This meta-study was conducted in the context of Finnish teacher education, and the aim was to re-analyse the main research findings of four previously published studies to provide new information on the topic under investigation. The original datasets of these studies included semi-structured interviews with teacher educators and a group discussion with four leaders of teacher education. The findings reveal that teacher educators' individual professional agency was particularly manifested in making decisions and implementing new ideas in their own work. Teacher educators' collective professional agency occurred via influencing shared issues at work and developing work practices via collaboration rather than via, for example, opposing and complaining. In particular, supportive collegial relationships and leadership practices, including practices promoting teacher educators' active participation, fostered professional agency. The scientific and educational contributions of this study encompass a more elaborated understanding of teacher educators' professional agency and of practices that promote their professional agency. In particular, the findings suggest that future research should explore ways of supporting teacher educators' professional agency via agency-promoting leadership in taking on the unpredictable challenges of teaching in the 21st century.

Tracing the enactment of agency in program design and development in teacher education

Presenting Author:Hege Hermansen, University of Oslo, Norway

This paper examines teacher educators' enactment of agency as an integrated part of program design and development. Over the past decades, teacher educators have faced increased expectations of program re-design and development, with the overall aim of improving both the quality of teacher education and the quantity of qualified teachers. However, very little research has examined how program leaders go about this work, and how agency is enacted by teacher educators in the context of developmental processes. This paper reports from a qualitative research project examining the work of program leaders at eight Norwegian higher education institutions. More specifically, the empirical analysis addresses how teacher educators enact agency as part of efforts aimed at program design and development. Theoretically, the paper is situated within cultural historical approaches to agency. Conceptually and analytically, the paper foregrounds how teacher educators recognise and respond to the demands inherent in their practices, and how the cultural tools associated with these practices create affordances and constraints for the enactment of agency. Three clusters of mediating resources were identified as particularly important to the participants' enactment of agency: organisational roles and routines; epistemic discourses and academic identities. Implications for program development and program leadership in teacher education are discussed.

Fostering Professional Digital Competence through transformative agency in Teacher Education

Presenting Author:Torunn Aanesland Strømme, University of Oslo, Norway; **Co-Author:**Greta Gudmundsdottir, University of Oslo, Faculty of Education, Norway; **Co-Author:**Lisbeth M Brevik, University of Oslo, Norway; **Co-Author:**Andreas Lund, University of Oslo, Norway

This study contributes to clarifying the connection between developing professional digital competence and transformative agency. The empirical setting is a Norwegian Master of Education programme, and this study examines how student teachers perceive and respond to challenging situations in their school practice through a small private online course (SPOC). The SPOC is intended to develop their professional digital competence (PDC), through transformative agency. Despite numerous studies on digital competence and some on transformative agency, the reciprocity of these two concepts has not been examined before in teacher education. The analyses reveal that student teachers demonstrate transformative agency but that such agency is extremely complex and holds numerous variables and permutations. The analysis also reveals how student teachers respond to challenging situations across university seminars and school practice, transforming these into opportunities for their professional development. As a conceptual contribution we added a fourth pillar to the three established pillars in the epistemic framework of PDC, based on the theoretical framing of transformative agency.

Session A 4

12 August 2019 12:00 - 13:30

Lecture Hall - H07

Single Paper

Motivational, Social and Affective Processes

Goal Orientation and Motivation

Keywords: At-risk students, Attitudes and beliefs, Comparative studies, Cultural psychology, Culture, Educational Psychology, Goal orientation, Learning approaches, Motivation, Quantitative methods, Self-regulation, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Inge Molenaar, Radboud University Nijmegen, Netherlands

The risk of implementing an approach to enhance motivation

Keywords: Learning approaches, Motivation, Self-regulation, Teaching/instruction

Presenting Author:Esther Canrinus, University of Agder, Norway; **Co-Author:**Marianne Engen Matre, University of Agder, Norway

In the Southern part of Norway, many secondary school pupils drop out due to lack of motivation. Our project aims to enhance pupils' desire to learn and to complete their education. Here, we investigate possible change in motivation after implementation of an intervention. We specifically focus on pupils' motivation for their subject, in this study: Norwegian. Meta-cognitive abilities and self-regulated learning have a positive effect on motivation. Therefore, we developed a five-step intervention to strengthen pupils' self-regulated learning and meta-cognitive abilities. In the intervention, pupils define a) what prevents them from being motivated for learning and b) how they can overcome possible obstacles hindering their learning. Additionally, they discuss this with their peers and formulate their own learning approach to the subject at hand, thus strengthening their sense of autonomy and relatedness. Pupils' motivation was measured at three time points across the school year (N=101, T1; N=76, T2; N=105, T3). MANOVA revealed that, over the course of the year, pupils became less intrinsically and more extrinsically motivated towards their subject, thus contradicting our expectations and previous findings. Although we aimed to target pupils' intrinsic motivation, the implementation of our study may also have reduced pupils' sense of autonomy, thus strengthening their external motivation and moving away from more student-centered learning.

Athlete and non-athlete students' perfectionistic strivings and achievement goal orientations

Keywords: At-risk students, Educational Psychology, Goal orientation, Motivation

Presenting Author:Jenny Ståhlberg, University of Helsinki, Finland; **Co-Author:**Antti Pulkka, National Defence University, Finland; **Co-Author:**Heta Tuominen, University of Helsinki, Finland; **Co-Author:**Markku Niemivirta, University of Oslo, Norway

This study investigated the connections between two goal-related constructs, perfectionism and motivation, and whether students studying in a combined programme of academics and sports differed in this regard from those of the ordinary academic track. More specifically, we examined (i) what kinds of perfectionistic profiles can be identified among athlete (i.e., sports programme) and non-athlete (i.e., ordinary programme) upper secondary school students (N = 424), (ii) how those profiles predict achievement goal orientations, and (iii) whether the possible effects vary between athlete and non-athlete students. Four perfectionistic profiles were identified: ambitious (relatively high standards, low discrepancy; 35.6 %), perfectionists (relatively high standards and discrepancy; 23.6 %), concerned (relatively low standards, high discrepancy; 21.7 %), and non-perfectionists (relatively low standards and discrepancy; 19.1 %). The concerned profile was slightly more frequent among non-athlete students. No interaction effects between study programme and profile on any orientation were found. Ambitious students emphasized mastery and performance-approach orientations, perfectionists were characterized by mastery-extrinsic and performance orientations, concerned students put stress on performance-avoidance and work-avoidance orientations, while non-perfectionists expressed relatively high levels only on work-avoidance orientation. Non-athletes reported higher levels of performance-avoidance orientation than athletes. The obtained results indicate that the different patterns of perfectionistic strivings seem to be a relevant predictor of the manner by which students orient towards achievement-related activities. Also, the proportion of perfectionists and concerned students imply that attention should be paid on how to support students to value their accomplishments.

A cross-cultural comparison of the patterning of achievement goal orientations

Keywords: Cultural psychology, Goal orientation, Motivation, Quantitative methods

Presenting Author:Markku Niemivirta, University of Oslo, Norway; **Co-Author:**Christian Brandmo, University of Oslo, Norway; **Co-Author:**Svetlana Kolic-Vehovec, University of Rijeka, Faculty of Humanities and Social Sciences, Croatia; **Co-Author:**Pahljina-Reinic Rosanda, University of Rijeka, Croatia; **Co-Author:**Barbara Roncevic Zubkovic, University of Rijeka, Faculty of Humanities and Social Sciences, Croatia

This study examined cross-cultural similarities and differences in the patterning of achievement goal orientations in three countries (i.e., Croatia, Finland, and Norway), and how those patterns were associated with students' ratings of importance, interest and perceived competence in mathematics. The participants were 1196 Croatian (50 % girls), 502 Finnish (51 % girls), and 424 Norwegian (52 % girls) 13-year olds, who completed a questionnaire assessing five different types of achievement goal orientations (i.e., preferences for certain goals and outcomes in an achievement-related context). They also evaluated the importance, interestingness, and own competence in different school subjects. After ensuring measurement equivalence, the students were classified into homogenous groups by means of latent class clustering. Configural frequency analysis was then used to examine the distribution of students of different nationalities in different groups. Finally, two-way ANOVAs are conducted in order to examine differences in importance, interest and own competence across the groups and countries. Five groups fit the data best, and based on their profiles, the groups were labeled as mastery-oriented (13.5 %), success-oriented (27.5 %), performance-oriented (17.8 %), normatively oriented (26.7 %), and avoidance-oriented (14.5 %). Examining the distribution of students of different nationalities in different groups revealed interesting variation, showing Croatian students to be over-represented in success- and performance-oriented groups, Finnish students in mastery- and avoidance-oriented groups, and Norwegian students in normatively oriented groups. Only achievement goal orientation group predicted students ratings of importance, interest, and own competence, thus suggesting similar effects across the countries.

Using metaphors to understand students' mindsets about intelligence in Germany and Canada

Keywords: Attitudes and beliefs, Comparative studies, Culture, Goal orientation

Presenting Author:Elisabeth Wegner, University of Freiburg, Germany; **Co-Author:**Nigel Mantou Lou, University of Alberta, Canada; **Co-Author:**Christina Späth, University of Freiburg, Germany; **Co-Author:**Pauline Mertens, University of Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Implicit theories of intelligence, or mindsets, have been shown to be an important factor in shaping learning, for example by influencing learning orientations. Recent research suggests a three-dimensional model of mindsets, consisting of entity, incremental and decremental beliefs. Despite the fact that mindsets have shown to vary between cultures, most research has been conducted within the Northern American context. Moreover, as other beliefs mindsets are often implicit and might not be completely accessible via questionnaires. Therefore, we aimed at exploring the power of a metaphor-based tool for assessing implicit aspects of mindsets and at the same time validating the three-dimensional constructs of mindsets as well as their relations to effort beliefs and goal orientation in a cross-cultural comparison between German (n = 97) and Canadian students (n = 108). To this end, students were presented three metaphors for the brain and had to choose for each one of three different explanations which were each related to different mindsets. Afterwards they filled-in questionnaires on mindsets, effort beliefs and goal orientations. Both measures, the questionnaires and the metaphor-based tool, showed that Canadian students were more likely to endorse incremental theories than German students. Also, we found significant differences between the two countries in the relation of mindsets to goal orientations and to effort beliefs, indicating that the role of mindsets for learning might be culturally dependent. Evidence on the validity of the metaphor-based tool and the three-dimensional structure of mindsets was mixed and warrants for further explorations.

Session A 5

12 August 2019 12:00 - 13:30

Seminar Room - S07

Single Paper

Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Learning and Professional Development

Keywords: Competencies, Ethnography, Higher education, In-service teacher education, Inquiry learning, Literacy, Professions and applied sciences, Qualitative methods, Quantitative methods, Reflection, Self-regulation, Social interaction, Teacher professional development, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Stephen Billett, Griffith University, Australia

Teacher collaboration in an independent research project: implications for self-regulated learning

Keywords: Ethnography, In-service teacher education, Inquiry learning, Self-regulation

Presenting Author:Ivy Lau, The University of Hong Kong, Hong Kong; **Co-Author:**Susan Bridges, The University of Hong Kong, Hong Kong

The implementation of an independent research project is frequently the focus of teacher collaboration. This study explored how interaction in its design at secondary school constructed the professional learning opportunities. The primary data source for this Interactional Ethnography (Green & Bridges, 2018) consisted of 42 video records of the teacher meeting across one school year. They were transcribed for discourse analysis and triangulated with other data sources such as artefacts and interviews. Results illustrated the mechanism of teacher collaboration which highlighted the dilemma between designing for the process and assessing the outcome of self-regulated learning. The teachers' practice over time identified the centrality of students' needs to the establishment of their collaborative culture. However, the issue of learner diversity limited the nature of an independent research project for its pedagogical transformation. Besides, it was challenging for teachers in devising tailor-made strategies to support individual students within the confined reality of innovative educational design at a school level. In exploring how teachers collaborated on self-regulated learning in the implementation of an independent research project, the overall analysis leads to the theoretical lens of problem-based learning and universal designed for learning. By superimposing these two frameworks, the study concludes with a flexible design for assessment equity in contemporary education.

Specialists' Views on Feedback at the Medical Workplace

Keywords: Professions and applied sciences, Qualitative methods, Social interaction, Workplace learning

Presenting Author:Helen Jossberger, University of Regensburg, Germany; **Co-Author:**Miriama Schlachtova, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

The aim of the present study was to explore the role of feedback at the medical workplace in the domain of radiology. Feedback is considered essential for

learning, performance and professional development, as it helps to build knowledge and skills. During residency, professional development is essential in order to become a specialist, and social interactions at the workplace are a potential source for learning. We conducted an interview study with 15 specialists and asked them what role feedback played for their own professional development. Moreover, we enquired how they interact with residents and how they provide feedback in their daily work. Content analysis was used to categorise participants' answers. Results show that specialists see feedback as an omnipresent phenomenon at the workplace. Thus they perceive it as central for training. Feedback is usually provided face-to-face in order to reinforce, to transfer knowledge, to improve domain-specific knowledge, to reduce mistakes, to improve the outcome for the patient, to change behaviour patterns, or to increase social skills. Although feedback at the workplace was considered important for professional development, physicians stressed that there is often not enough time to discuss performance and possibilities for performance improvements. Forming tandems between less and more experienced physicians, so that learning becomes more embedded in medical practice and work activities might be a facilitating condition at the workplace.

Exploring student futures as business graduates: insights from capstone and internship experiences

Keywords: Higher education, Literacy, Reflection, Workplace learning

Presenting Author:Colin Jevons, Monash Business School, Australia; **Co-Author:**Sophie Lindsay, Monash, Australia; **Co-Author:**Dawn Bennett, Curtin University, Australia; **Co-Author:**Kelly Benati, Monash University, Australia

Employability or 'work-ready' curricular initiatives are designed to help students conceptualise and prepare for their future careers, yet students often have a poor understanding of what their careers might look like and they rarely engage in strategic career planning. The two-phase qualitative study reported here assisted final-year undergraduate business students to plan their future lives and work by supporting their development of career- and self-awareness: their career literacy. In Phase 1 we explored the concept of career literacy with 35 final-year business students. Leximancer mapping of the two-part, career literacy-focused inquiry showed that the business students primarily attributed graduate success with having proficiency in oral communication skills. Of concern, the same students reported that their own oral communications skills were under-developed; they also felt that they were not sufficiently career aware. We wondered whether students' self-assessments were aligned with the expectations of graduate employers. In Phase 2 we compared student and industry assessments of a second students cohort. We surveyed 44 final-year business students and their industry hosts whilst the students were completing industry placements. Phase 2 revealed significant differences in hosts' ratings of students' oral communication skills and the students' far lower self-ratings. The findings suggest that some final-year students have unrealistic expectations about the communication skills required after graduation, and that their lack of career awareness leads them to underestimate their ability to articulate their strengths to future employers. The findings suggest the need to help students develop better career awareness and more realistic self-assessment.

Teacher self-regulation and stress: an intervention study to strengthen professional competence

Keywords: Competencies, Quantitative methods, Self-regulation, Teacher professional development

Presenting Author:Simone Berweger, Zurich University of Teacher Education, Switzerland; **Presenting Author:**Christine Wolfram, University of Teacher Education Zurich, Switzerland; **Co-Author:**Andrea Keck Frei, Zürich University of Teacher Education, Switzerland; **Co-Author:**Zippora Bühner, Zurich University of Teacher Education, Switzerland; **Co-Author:**Christine Bieri Buschor, Zurich University of Teacher Education, Switzerland

Teaching is a challenging profession which is associated with high levels of stress. Drop-out rates during the first five years in the profession are high – among other reasons, due to occupational stress. Self-regulation, in terms of «self-management», is one of the core professional competences that have a positive impact on the remaining in teaching, career development, teachers' well-being and teaching quality in the classroom. The aim of this study therefore is to strengthen teachers' self-regulation and self-efficacy and to reduce stress and emotional exhaustion through an action-oriented self-management training combined with coaching. We conducted an experimental field study (control group design) with N = 216 kindergarten and primary school teachers in their first two to four years after graduation that examines the effects of a standardized self-regulation-training, including forms of coaching. In a pre-, post- and two follow-up-tests, four treatment groups and a control group are compared in terms of self-regulation, self-efficacy, stress and emotional exhaustion. The results from the pre- and post-test indicate a significant change over time in emotional exhaustion and self-regulation. However, the change in emotional exhaustion and self-regulation is not different for the three groups.

Session A 6

12 August 2019 12:00 - 13:30

Seminar Room - S15

Single Paper

Assessment and Evaluation, Higher Education, Lifelong Learning

Competencies in Learning and Professional Development

Keywords: Assessment methods and tools, Citizenship education, Cognitive skills, Competencies, Developmental processes, Higher education, Lifelong learning, Problem solving, Secondary education, Student learning, Vocational education

Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development

Chairperson: Valerie Sotardi, University of Canterbury, New Zealand

Influence of Attended Courses on Domain-specific Knowledge Growth in Higher Education Economics

Keywords: Assessment methods and tools, Competencies, Higher education, Student learning

Presenting Author:Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Jasmin Schlaw, Johannes Gutenberg-University Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Judith Jitomirski, Humboldt-University Berlin, Germany; **Co-Author:**Carla Kühling-Thees, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Roland Happ, Johannes Gutenberg University Mainz, Germany

The presented longitudinal study investigates the development of students' economic knowledge over the course of studies and the influence of learning opportunities as well as further potential personal influencing factors. For this purpose, the results of students of business and economics in an economic knowledge test at the beginning of their studies and one year later are examined. Overall, there is a positive change in the economic knowledge of students. Regression analyses indicate that attending courses in business and microeconomics exert a significant influence on the development of economic knowledge, as do high school leaving grade and the student's main communication language. No influence, however, can be found for other attended lectures/courses, nor fluid intelligence.

Entrepreneurial competences in student companies at school: Development of a research instrument

Keywords: Assessment methods and tools, Citizenship education, Competencies, Secondary education

Presenting Author:Taiga Brahm, University of Tübingen, Germany; **Co-Author:**Ute Grewe, University of Tuebingen, Germany

Developing entrepreneurial competences for adolescents is seen as a means to foster and increase not only the number of start-ups but also an entrepreneurial attitude. In recent years, numerous studies on entrepreneurship education and its practical relevance were published and various programmes to implement entrepreneurship education in forms of student companies at schools have been initiated. However, little is known about its relation with students' development of entrepreneurial competences. Also, a competence framework targeted at students in secondary education is still missing. This study seeks to fill this gap by building a competence framework which was then used to develop a research instrument to assess entrepreneurial competences. The resulting questionnaire was used in two cohorts of adolescents participating in student companies (64 (pilot study)/226 (main study)). To ensure the internal consistency of the scales, factor and reliability analyses were carried out. Overall, the instrument proved to be reliable and valid and advances research on entrepreneurship education. From a practical point of view, the instrument can be used to diagnose students' entrepreneurial competences. In the long run, the instrument may help to further develop the evidence-based design of student companies.

Career competence in secondary schools: the impact of endogenous factors

Keywords: Competencies, Developmental processes, Lifelong learning, Secondary education

Presenting Author:Svenja Ohlemann, Technische Universität Berlin, Germany; **Co-Author:**Katja Driesel-Lange, Westfälische Wilhelms-Universität Münster, Germany

Career development is nowadays seen as a life-long process. Drawing from the theoretical model of career competence, adolescents need to develop career competence to successfully manage their transition from school to work as a milestone for future work fulfillment and well-being. This study aims to shed light on how endogenous factors such as gender, achievement motivation and self-efficacy relate to adolescents' developmental state of career competence in German secondary school. Studying a cross-sectional data set of students from grade seven to grade thirteen ($N = 4.177$), we performed a three-step latent profile regression (LPR). The career competence profiles resulting from the initial latent profile analysis were regressed on endogenous factors and then analyzed regarding mean differences of those factors. The results suggested four profile groups, three of low, intermediate and advanced level and one diverging group in terms of competence pattern.

Disentangling the interplay of knowledge, intelligence and general competences in problem solving

Keywords: Cognitive skills, Competencies, Problem solving, Vocational education

Presenting Author:Andreas Rausch, University of Mannheim, Germany; **Co-Author:**Kristina Kögler, University of Hohenheim, Germany

A cross-sectional study was conducted in the field of commercial vocational education and training (VET) to investigate the influences of domain knowledge, fluid intelligence, numeracy, and literacy on problem-solving performance in the business domain. A total of 786 German VET students participated. They completed three authentic computer-based problem scenarios and further tests. Domain knowledge proved to be the strongest predictor of domain-specific problem solving. Altogether, the four predictors explained 37 % of the variance in problem solving. However, the interplay of these variables is more complex. According to the 'Elshout-Raaheim-hypothesis' correlations between intelligence and problem solving are supposed to be low under conditions of low and high domain knowledge, while the correlation should be high under the condition of medium knowledge in the domain of the problem. However, in our sample, the correlation between intelligence and problem solving hardly differed between groups of low, medium and high domain knowledge. Interestingly, participants with low domain knowledge benefited from literacy, while participants with high domain knowledge particularly benefited from numeracy. More explorative approaches will be applied to further analyse the complex interplay of the involved variables.

Session A 7

12 August 2019 12:00 - 13:30

Lecture Hall - H11

Single Paper

Higher Education

Quantitative Methods in Higher Education

Keywords: Competencies, Developmental processes, Educational Psychology, Higher education, Mixed-method research, Motivation and emotion, Qualitative methods, Quantitative methods, Quasi-experimental research, Survey Research

Interest group: SIG 04 - Higher Education

Chairperson: Lori Lockyer, University of Technology Sydney, Australia

Interrelations between perceived learning environment in higher education and students' test anxiety

Keywords: Educational Psychology, Higher education, Motivation and emotion, Quantitative methods

Presenting Author:Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Doris Ittner, PH Bern - School of Teacher Education, Switzerland; **Co-Author:**Florian Hofmann, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany; **Co-Author:**Melanie Stephan, University of Erlangen-Nuremberg, Germany; **Co-Author:**Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:**Annette Lohbeck, Universität Hamburg, Germany; **Co-Author:**Andrea Bernholt, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

This contribution seeks to investigate the relation between quality factors of the study environment in higher education and students' test anxiety, while controlling personal factors, such as neuroticism. Test anxiety was conceptualized according to the differentiation between "worry" and "emotionality" as introduced by Liebert and Morris (1967). A total of 634 German students studying teacher education completed a paper-pencil administered questionnaire. The results indicate that the perceived performance pressure best explains test anxiety, but other characteristics of the learning environment, such as the fairness and transparency of the performance assessment, also correlated significantly with test anxiety. Additionally, the results suggest that perceived teacher-orientated and student-orientated teaching approaches are both positively but weakly associated with test anxiety. The findings are discussed with regard to factors of teaching quality that are relevant for students' experiences of test anxiety.

Valid Measurement of Professional Competencies in Higher Education – Challenges and Perspectives

Keywords: Competencies, Higher education, Qualitative methods, Quantitative methods

Presenting Author:Hans Anand Pant, Humboldt Universität zu Berlin, Germany; **Co-Author:**Jennifer Fischer, Johannes Gutenberg-Universität, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Corinna Lautenbach, Humboldt Universität Berlin, Germany

In order to foster higher education students' professional competencies according to the current requirements of the 21st century, objective and reliable information about how students acquire competencies over the course of their studies are required. Only on this basis, the corresponding implications for curricular and instructional practice can be derived. As meta-analyses show, however, there were hardly any competency assessments available before 2011 which met the international standards for educational testing (AERA et al. 2014). Thus, this nation-wide large-scale research program [anonymised] was funded by the Federal Ministry of Education and Research. In the first funding phase (2011-2015), a total of 25 research collaboration projects with over 220 scientists from various disciplines developed and validated theoretical-conceptual competency models with corresponding instruments for measuring professional domain-specific and generic competencies in five major study domains (e.g. teacher education, economics, STEM). Based on the findings, the second funding phase (2015-2019) focuses on in-depth validation and methodological innovations in competency assessment. Around 40 competency assessments in five study domains are currently being tested and validated according to the Standards. Innovative approaches mostly include performance-based assessments such as computer-, and simulation-based instruments. The newly developed test instruments provide significant information on the competency development of students during their studies in higher education, and the majority of the developed assessments can also be used to forecast professional performance; they help to answer the question of how students learn and how teaching and learning can be optimised in other educational contexts (e.g. further education).

Modeling and predicting sustainable changes in university students' satisfaction

Keywords: Developmental processes, Higher education, Quantitative methods, Survey Research

Presenting Author:Christoph Kiefer, RWTH Aachen University, Germany; **Co-Author:**Axel Mayer, RWTH Aachen University, Germany

Large-scale panel studies like the National Educational Panel Study (NEPS) in Germany are designed to provide representative, longitudinal data about educational processes. However, the statistical analysis of research questions about changes is not straightforward. For example, investigating a research question like "Does a change of major improve students' satisfaction with their academic success sustainably?" requires a statistical model that considers three major challenges: a) potentially non-linear trajectories of satisfaction, b) multiple levels of analysis, and c) a measurement model as satisfaction is a latent variable. We use NEPS data to illustrate how to answer such substantive research question in large-scale educational studies with the multilevel latent growth

component model. We model a) the development of university students' satisfaction with their academic success (SAS) over four years, b) study program- and individual-level trajectories of SAS, c) measurement error in the items measuring SAS, and d) predictors of trajectories on different levels. At the study program level, we found that satisfaction increases significantly after the first year of studies and remains relatively constant afterwards on average. On the individual level, change of major after the first year resulted in a sustainable gain in satisfaction. At the study program level, burden of examination of the study program was negatively linked to change of students' satisfaction, while at the individual level burden of examination was positively linked to change of student's satisfaction.

The effects of a Biomedical Sciences curriculum reform on students' competence development

Keywords: Competencies, Higher education, Mixed-method research, Quasi-experimental research

Presenting Author:Sanne Rovers, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands; **Co-Author:**Hans Savelberg, Maastricht University, Netherlands

The current study reports on the effects of a curriculum reform within the Biomedical Sciences bachelor program on students' development of biomedical and general academic competencies. Two cohorts of students (Cohort 1 starting before, and Cohort 2 starting after the curriculum reform) were surveyed at the end of each academic year, throughout the three years of the program. Significant effects were found for study year, indicating improvement in students' self-perceived competency as they progressed through the program. However, contrary to our expectations, students from Cohort 2 did not report better competences than students from Cohort 1, with students from Cohort 1 in fact reporting higher competence in one of the domains. No interactions between study year and cohort were found, indicating no differential development in the different cohorts. Results are discussed in light of students' awareness regarding gaps in their knowledge, which was corroborated by findings from focus groups.

Session A 8

12 August 2019 12:00 - 13:30

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Single Paper

Higher Education, Learning and Instructional Technology, Lifelong Learning

Online Learning and Technology-Enhanced Learning and Instruction

Keywords: Achievement, Computer-assisted learning, E-learning/ Online learning, Higher education, Informal learning, Lifelong learning, Meta-analysis, Motivation, Problem solving, Quantitative methods, Workplace learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Lifelong learning: The formal and informal learning in technology-rich environments

Keywords: Informal learning, Lifelong learning, Problem solving, Workplace learning

Presenting Author:Hanna Nygren, University of Jyväskylä, Finland; **Co-Author:**Juhani Rautopuro, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Kari Nissinen, University of Jyväskylä, Finland; **Co-Author:**Bram De Wever, Ghent University, Belgium

This study focuses on adults' problem-solving skills in technology-rich environments (TRE) as a novel approach to investigate formal and informal learning based on the PIAAC data. To address the lifelong learning perspective, in addition to formal and informal learning activities, we specifically examine the role of age in relation to problem-solving skills. This study is based on the PIAAC (Programme for the International Assessment of Adult Competencies) data and will be analysed with statistical methods. The results bring out knowledge for the factors that contribute to successful lifelong learning. Through this study, we can promote learning skills in technology-rich environments (TRE) and design more appropriate learning environments.

An empirical study on factors influencing barriers to learning in Massive Open Online Courses.

Keywords: Achievement, E-learning/ Online learning, Lifelong learning, Quantitative methods

Presenting Author:Maartje Henderikx, Open University of the Netherlands, Netherlands; **Co-Author:**Karel Kreijns, Open University of the Netherlands, Netherlands; **Co-Author:**Marco Kalz, University of Education Heidelberg, Germany

MOOCs are promising opportunities for lifelong learning as they are accessible to everyone and cover an ever-expanding range of topics and interests. Yet, as promising as these learning opportunities seem, many learners do not succeed in pursuing their personal learning goals. Barriers to learning are the main reason for not finishing the intended (parts of) the MOOCs. The research question addressed in this paper is whether factors can be identified that affect the encounter of barriers while progressing through the MOOC. In particular, age, gender, educational level, and online learning experience were the investigated factors. Based on the analysed data which was gathered by using pre- and post-questionnaires It is challenging to combine work and family life with lifelong (online) learning activities. Especially for female learners between 20 and 50 years old. Yet, more experience with online learning has a positive effect on coping with these challenges. Also, learners with a lower educational level more often experience a lack of knowledge or have difficulties with the course content than learners who are more academically educated. These results may serve as input to support, advise and prepare potential MOOC-learners embarking on new learning journeys.

A lossless person-oriented analysis of web lecture beliefs, motivation and lecture utilization

Keywords: Computer-assisted learning, E-learning/ Online learning, Higher education, Motivation

Presenting Author:Cornelis de Brabander, Leiden University, Netherlands; **Co-Author:**Nadira Saab, Leiden University, Netherlands; **Co-Author:**Folke Glastra, Leiden University, Netherlands

In higher education teaching students often takes place by means of oral presentations in the form of lectures. To give students more control over their learning, more and more universities provide students with recordings of lectures, so called weblectures. Our aim is to explore patterns of motivation beliefs and beliefs about the profits of weblectures in relation to utilization of web lectures and physical attendance of lectures. 324 Psychology students of 8 courses at a University in The Netherlands participated in this study. All of the courses in this study were offered in the same semester and consisted of a series of lectures which were captured in weblectures. Questionnaires were administered online to all participants. The relation between background variables, motivation, weblecture beliefs, lecture attendance, and use of weblectures was investigated with a path analysis. The profile analysis of the motivation items resulted in three profiles the *management-oriented student*, the *interested student*, and the *ability-oriented student*. According to the path analysis motivation was slightly related to lecture attendance. However, the interested student and the ability-oriented student tend to miss a lecture every now and then. The management-oriented student showed a slightly higher motivation level, and the ability-oriented student a slightly lower motivation level. The more positive students were about the weblectures benefits the higher their utilization of weblectures and the lower their attendance of lectures. Students stressing learning support visited the lectures more faithfully, while students valuing planning profits higher tended to miss lectures and to utilize weblectures more often.

Webinars in Higher Education and Professional Training: A Meta-Analysis

Keywords: Achievement, Computer-assisted learning, E-learning/ Online learning, Meta-analysis

Presenting Author:Andreas Gegenfurtner, University of Passau, Germany; **Co-Author:**Christian Ebner, Technische Hochschule Deggendorf, Germany

Digital learning environments are increasingly popular in higher education and professional training. A widely used approach are webinars, in which participants and educators are connected from distant geographical locations using shared virtual platforms—such as Adobe Connect or Cisco WebEx—and interact synchronously in real time via VoIP and web camera equipment. However, past studies report mixed evidence concerning the effectiveness of webinars in promoting student achievement. As a remedy, this meta-analysis ($k = 15$, $N = 1,291$ participants) cumulates observed effect sizes from previously published randomized controlled trials and corrects artifactual variance induced by sampling error. The research questions were: How effective are webinars in promoting

student achievement? And which characteristics moderate webinar effectiveness. The findings suggest that webinars were slightly more effective than control conditions—asynchronous learning management systems and face-to-face classrooms—but the differences were trivial. Differences were moderated by publication, participant, achievement, assessment, and webinar characteristics. This meta-analysis is the first to systematically review and meta-analyze the best evidence available for evaluating the effectiveness of webinars and web conferencing systems in promoting student achievement. Implications of the study findings inform educational technologists and theorists interested in the design and delivery of webinar-based learning environments.

Session A 9

12 August 2019 12:00 - 13:30

Seminar Room - S14

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes

Social Interaction in Learning and Instruction

Keywords: Attitudes and beliefs, Communities of practice, Competencies, Cultural psychology, Distributed cognition, Educational Psychology, Mathematics, Qualitative methods, Secondary education, Social aspects of learning and teaching, Social development, Social interaction, Special education, Student learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 17 - Methods in Learning Research

Chairperson: Sabine Schlag, University of Wuppertal, Germany

A dialogical approach to large-scale assessments: Students' reasoning about items in PISA and TIMSS

Keywords: Competencies, Mathematics, Social aspects of learning and teaching, Student learning

Presenting Author: Jelena Radisic, University of Oslo, Norway; **Co-Author:** Aleksander Baucal, University of Belgrade, Serbia; **Co-Author:** Smiljana Josic, Institute for Educational Research (Belgrade), Serbia

Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) are among the most influential international large-scale assessments (ILSA) offering a comparative perspective vital for improvement of the quality of education in countries around the world. ILSAs are rather oriented towards evaluating students' answers as right and wrong in an attempt to capture if students have adopted particular concepts and/or have mastered certain reasoning strategies. On the other hand, studies grounded in socio-cultural perspective have demonstrated that whenever a student is engaged in a cognitive task, thinking and interpretation processes behind make the situation of solving the task dialogical and situational in its very nature, thus contesting some of ILSAs' premises. The paper proposes and discusses a methodological approach that puts these two perspectives into a dialogue, allowing mimicking test situations from ILSAs while taking advantage of studies embedded in the socio-cultural theory. Examples of gathered insights are taken from two studies using PISA and TIMSS released items with students belonging to different age groups, in which the approach was tested in. The examples will be discussed to demonstrate situations in which students' wrong answers and the 'inability' to solve a task is not necessarily due to their lack of competence, when particular task nuances contribute students to give a wrong answer and how the proposed methodology can be further developed in the context of ILSAs push towards computer-based assessments.

Hybrid minds and the socio-material nature of human cognition: Learning research in a digital age

Keywords: Communities of practice, Cultural psychology, Distributed cognition, Educational Psychology

Presenting Author: Roger Säljö, University of Gothenburg, Sweden

Hybrid minds and the socio-material nature of human cognition: Learning research in a digital age A conceptual challenge for research on learning and cognition is the epistemological commitment to maintaining a strict division between minds and artifacts. An obvious illustration is the study of memory, where remembering is studied as if memory practices were located in the individual mind or even brain. However, as is evident from any observation of how people remember in their everyday lives, remembering is achieved largely through the reliance on artifacts (calendars, texts, digital devices). The same applies to learning and knowing. When learning we are not just committing information to our minds; we are using the external artifacts of culture—documents, physical tools etc.—to increase our capacity to conceptualize and understand the world. To overcome this problematic division between minds and the socio-material world, the evolutionary psychologist Merlin Donald suggests that we view the human mind as a hybrid mind, i.e. it is turned outwards and operates in collaboration with artifacts (and other people). The implications for the study of learning of this hybridity of cognition are considerable; to an increasing extent we know and learn by interacting with powerful technologies that provide access to the experiences accumulated in society. In this sense, cognition is located at the intersection between minds and artifacts that have emerged in society, and learning cannot be understood or theorized unless the significance of both these constituents are recognized and integrated into the unit of analysis.

Inclusive Classroom Norms and Children's Attitudes toward Students with Hyperactive Behavior

Keywords: Attitudes and beliefs, Social development, Social interaction, Special education

Presenting Author: Luciano Gasser, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:** Jeanine Grütter, University of Teacher Education Lucerne (PH Luzern), Switzerland; **Co-Author:** Loredana Torchetti, University of Teacher Education Lucerne (PH Luzern), Switzerland

As the classroom represents an important social context for the development of out-group attitudes, the current study investigated the role of inclusive classroom norms for students' attitudes toward hyperactive peers. The study included 1209 Swiss children from 61 school classes who were surveyed in the fifth grade (T1) and in the sixth grade (T2) ($M_{ageT1} = 11.55$ years, $M_{ageT2} = 12.58$ years). Students' attitudes towards hyperactive children was assessed by self-reports on students' sympathy and intended inclusion toward hypothetical children who show hyperactive behavior. Moreover, students rated their classmates' inclusive attitudes. Analyses with an autoregressive multilevel path model revealed that inclusive classrooms norms in the fifth grade predicted students' sympathy and intended inclusion toward hyperactive children in the sixth grade. The results implicate that group-level analyses are important in order to explain hyperactive children's peer group problems.

The implementation of participatory approaches in interviews involving adolescents

Keywords: Qualitative methods, Secondary education, Social aspects of learning and teaching, Social interaction

Presenting Author: Gilles Dieumegard, Université de Montpellier, France; **Co-Author:** Emma Cunningham, University of Auckland, Faculty of Education, New Zealand

Research highlights the importance of capturing children's experiences and reflects on how to effectively access it; adolescents are often underrepresented in this literature. In reality conducting interviews with them represents a challenge, either for their participation, or their confidence when reporting their experience to researchers. How can researchers effectively engage with adolescents in order for them to feel confident in interview situations? This question is explored within the context of two different studies in which adolescents were asked to report experiences in relation to their schooling. In the first study, adolescents were requested to draw pictures that supported the interview. In the second study, three conditions (cameraman, interview to the double, cards drawing) introduced in video interviews created an enjoyable atmosphere.

Session A 10

12 August 2019 12:00 - 13:30

Seminar Room - S03

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes

Peer Interaction

Keywords: Collaborative Learning, Emotion and affect, Higher education, In-service teacher education, Language (Foreign and second), Peer interaction, Quantitative methods, Science education, Social aspects of learning and teaching, Social interaction, Student learning, Video analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Lauren Barth-Cohen, University of Utah, United States

Perceived Teacher Affective Support and Relatedness to Peers in Relation to EFL Achievement Emotions

Keywords: Emotion and affect, Language (Foreign and second), Peer interaction, Quantitative methods

Presenting Author:Ezgi Guney, Middle East Technical University, Turkey; **Presenting Author:**Yesim Capa Aydin, Middle East Technical University, Turkey

The present study aimed at examining the role of perceived teacher affective support and sense of relatedness in English as a Foreign Language achievement emotions of middle school students. There were 810 middle school students studying at four different private schools. As data collection instruments, Achievement Emotions Questionnaire - English (AEQ-E), Perceived Teacher Affective Support Scale, and Relatedness to Peers Scale were administered. Confirmatory Factor Analysis of the AEQ-E scale yielded the proposed factorial structure with seven dimensions. The Cronbach alpha coefficients for each dimension ranged from .82 to .89. PTAS scale revealed a one-factor structure with a reliability coefficient of .95. On the other hand, Relatedness to Peers scale demonstrated one-factor structure with a reliability coefficient of .74. Canonical correlation results indicated both perceived teacher affective support and relatedness to peers were positively associated with positive achievement emotions (enjoyment and pride) and negatively correlated to negative achievement emotions (anger, anxiety, boredom, shame, and hopelessness). **Keywords:** Emotion and Affect, Peer Interaction, Language (Foreign and second), Quantitative methods

Investigating functional participatory roles in productive collaborative science learning

Keywords: Collaborative Learning, Peer interaction, Science education, Video analysis

Presenting Author:Olli-Pekka Heinimäki, University of Turku, Finland; **Co-Author:**Simone Volet, Murdoch University, Australia; **Co-Author:**Marja Vauras, University of Turku, Finland

In this paper two studies are presented, where *functional participatory roles* are examined within high and low outcome groups in diverse collaborative science learning datasets. The first study consists of Finnish high-school students experimenting in small groups of three in virtual learning environment, and the second study consists of Australian primary teacher students experimenting in small groups of four with a hands-on activity at university science course. Two high and two low outcome groups were selected from both datasets for role analysis. The analysis was conducted at the turn level from video footage. The results show that roles focused on performance and procedural matters were the most dominant in each group across the two datasets. The most significant differences were found in roles focusing on science content, which were more frequent in high outcome groups, and concerning opinion focused roles, which were more frequent in low outcome groups. However, also some inter-study differences were identified. In addition, hierarchical cluster analysis was conducted to investigate more general role patterns within the groups. Rather similar meaningful role patterns emerged across the two datasets. More productive and flexible clusters of roles were found, and roles were more evenly distributed in high outcome groups compared to low outcome groups, where less productive role combinations and less variation in the clusters among the group members was identified. In-depth discussion of the results across the two studies will be given in the presentation.

School engagement, peer academic support, and peer networks among Finnish 7th graders

Keywords: Peer interaction, Social aspects of learning and teaching, Social interaction, Student learning

Presenting Author:Tuire Palonen, University of Turku, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland; **Co-Author:**Kai Hakkarainen, University of Helsinki, Finland

This study examines how students' engagement with school work and school achievement is related to the size of their peer network and school help network. Participants (N=196) were 7th graders from three Finnish lower secondary schools. The data for the study were collected by two questionnaires, one for school work engagement and one for social network ties. Correlation analyses, social network analyses, t-tests and k-means cluster analysis were employed for the study. Our results show that school engagement is positively associated with school achievement and size of the peer network, i.e. popularity. It is also a characteristic of "school helpers" to whom other students go for academic support. Four kinds of student types were found based on cluster analysis: 1) engaged helpers that were not very popular in their peer network (N=4), 2) high performing school helpers that also asked help for themselves (N=36), 3) socially passive average performers (N=95), and 4) socially active and popular low-performers (N=40). The study contributes especially in elaborating the nature of adolescents' peer academic help networks. Differences between students are found when studying those who are willing to help other students ("helpers"), not in school help seeking as such that can be related to many kind of goals. Girls are more active school helpers than boys.

The Networked Student: Contextualizing Scientific Knowledge for Educational Practice

Keywords: Collaborative Learning, Higher education, In-service teacher education, Peer interaction

Presenting Author:Marjan Vermeulen, Heerlen Open Universiteit, Netherlands; **Co-Author:**Femke Nijland, Open University, Netherlands; **Co-Author:**Olga Firsova, Open University of the Netherlands, Netherlands; **Co-Author:**Stefan Robbers, Open University Netherlands, Netherlands

Informal learning activities that entail social interaction with others are found to be a way to relate scientific research knowledge to teachers' professional practice. For adult students with a professional background in education, social learning in networks, can constitute an important way to make academic study relevant for practice. However, not much is known on how learning in networks contribute to learning outcomes in an academic, higher education practice. To study how networked learning contributes to meaning making and contextualizing of scientific knowledge for educational practice, a study was conducted in a distance master level program for teachers aspiring an academic degree in Educational Sciences. Principles of networked learning were applied to course design in a three-phase intervention: (1) creating of network awareness, (2) providing learners with tools for developing networking skills and (3) assessing of the value created in the network throughout the course. By combining Social Network Analysis and a value creation perspective on learning, meaning making processes between scientific knowledge and the applicability of this knowledge in their everyday educational practice were reconstructed. Relations with learning outcomes expressed through the given grade based on the assignment of the course were significant.

Session A 11

12 August 2019 12:00 - 13:30

Seminar Room - S04

Single Paper

Higher Education, Learning and Social Interaction

Argumentation, Dialogue and Reasoning

Keywords: Argumentation, Biology, Engineering, Higher education, Inquiry learning, Literacy, Mathematics, Reading comprehension, Reasoning, Science education, Social interaction, Teacher professional development, Teaching approaches

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France

Why is dialogic instruction so difficult to implement? The forces of rituals in the math classroom

Keywords: Inquiry learning, Mathematics, Teacher professional development, Teaching approaches

Presenting Author:Einat Heyd-Metzuyanin, The Technion Israel Institute of Technology, Israel

Despite strong evidence for the productiveness of dialogue and explorations in the mathematics classroom, explorative instruction is still rare in most classrooms. In this talk, I trace the reasons for the persistence of ritual instruction to three forces: the structure of the mathematical discourse, the ubiquity of

rituals in classrooms stemming from their social and cultural nature, and the status of teachers themselves being peripheral to explorative practices in the discipline. My empirical examples will be taken from papers recently published in a special issue on ritual and explorations I co-edited for Educational Studies in Mathematics, as well as my own research on professional development for explorative mathematics instruction.

Reasoning like a student vs. reasoning like an engineer: Can PBL shift students' thinking?

Keywords: Argumentation, Engineering, Reasoning, Social interaction

Presenting Author:Susan Nolen, University of Washington, United States; **Co-Author:**Edward Michor, Oregon State University, United States; **Co-Author:**Milo Koretsky, Oregon State University, United States

Problem-based learning (PBL) approaches to engineering education aim to teach disciplinary knowledge through collaborative work on ill-structured and realistic problems to induce students to "think like engineers." But goal-directed activity (i.e., reasoning, design, argumentation) is structured by the activity systems in which it occurs. PBL tasks are situated in the activity system or "figured world" of engineering *school*, not in engineering firms. We ask, therefore, whether and how PBL tasks are taken up by students "thinking like engineers" vs. "thinking like students." An analysis of three student teams found that teams moved between school and engineering worlds, with differences in argumentation, reasoning, and participation distribution, as they used engineering tools to address a realistic engineering problem. Teams switched from familiar "school world" to "engineering world" thinking when hitting "snags" opened space for broader participation, or when systems analysis strategies were used. Implications for designing instruction via PBL are discussed.

The development of undergraduates' mechanistic explanations of gene environment interaction

Keywords: Biology, Literacy, Reasoning, Science education

Presenting Author:Michal Haskel-Ittah, Weizmann Institute of Science, Israel; **Co-Author:**Ravit Duncan, Rutgers University, United States; **Co-Author:**Anat Yarden The Weizmann Institute of Science, Weizmann Institute of Science, Israel

Mechanistic reasoning enables the construction of explanations to events in multiple domains. The ability to reason in a certain field is dependent on various factors such as knowledge in the field and general strategies for reasoning. In this study we aimed to understand the effect of contextual features and the level of domain specific knowledge on mechanistic explanations in biology. We interviewed undergraduate students at different levels of their studies and asked them to explain several phenomena that involved gene-environment interaction. Most, if not all, traits are impacted by environmental factors and understanding these interactions is a major focus of genetics research and critical to genetics literacy. We analyzed those interviews and characterized three types of mechanistic explanations. One of the three, which seems to require more domain specific knowledge than the other two, is crucial for understanding genetics. We found that contextual features may drive students to think of this type of mechanism even when their domain specific knowledge is limited.

Developing and validating proof comprehension tests in university mathematics

Keywords: Argumentation, Higher education, Mathematics, Reading comprehension

Presenting Author:Juan Pablo Mejia-Ramos, Rutgers University, United States; **Co-Author:**Keith Weber, Rutgers University, United States; **Co-Author:**Kristen Lew, Texas State University, United States

Proof is central to mathematical practice. At the university level, mathematics researchers and students spend a substantial amount of time constructing, presenting, and reading mathematical proofs. In this paper, we discuss the notion of reading comprehension in mathematics, focusing on the concept of proof comprehension, i.e. an individual's ability to read, process, and understand mathematical proofs. We first describe a model for assessing proof comprehension in university level mathematics, and a method for using this model to generate and validate short, reliable proof comprehension tests. We report findings (e.g. item difficulty, test reliability and dimensionality) from the distribution of three of these tests to approximately 200 university mathematics students in the United States. We describe ways of using this proof comprehension model and these tests in classrooms and in the design of instructional innovations to help improve students' proof comprehension. We end by discussing avenues for future research in the area.

Session A 12

12 August 2019 12:00 - 13:30

Seminar Room - S02

Single Paper

Assessment and Evaluation, Cognitive Science

Assessment Methods and Tools

Keywords: Assessment methods and tools, E-learning/ Online learning, Early childhood education, Educational Psychology, Higher education, Learning disabilities, Learning Technologies, Mathematics, Mixed-method research, Motivation and emotion, Psychometrics, Quantitative methods, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 15 - Special Educational Needs, SIG 17 - Methods in Learning Research, SIG 22 - Neuroscience and Education

Chairperson: Irma Talic, University of Luxembourg, Luxembourg

In situ, synchronous self-assessment: a new research strategy for accessing individual SA processes.

Keywords: Assessment methods and tools, Mixed-method research, Motivation and emotion, Self-regulation

Presenting Author:Ana Remesal Ortiz, Universitat de Barcelona, Spain; **Co-Author:**Abolfazl Khanbeiki, Universitat de Barcelona, Spain; **Co-Author:**Sareh Attareivani, Universitat de Barcelona, Spain; **Co-Author:**Zarah Parham, Universitat de Barcelona, Spain

We present results of a study on students' emotional and cognitive processes underlying in-situ, synchronous self-assessment, understood as the learner's own learning assessment performed simultaneously with the teacher's assessment in the classroom. Six class groups summing up 210 pre-service teachers participated across kindergarden, primary and secondary education levels. Data were gathered following a mixed-method strategy in three different phases: (a) general survey of prior knowledge, beliefs about assessment and learning approaches; (b) general survey of emotional and cognitive processes during classroom assessment; (c) in-depth interviews with selected students after receiving feedback. Results are presented focusing on two aspects: (1) the utility of the research strategy; and (2) the emotional and cognitive processes identified to inform our knowledge of individual self-assessment processes.

Factor structure of the CLASS in Singapore preschools serving mainstream and special needs children

Keywords: Assessment methods and tools, Early childhood education, Psychometrics, Quantitative methods

Presenting Author:EeLynn Ng, National Institute of Education, Singapore; **Co-Author:**Rebecca Bull, Macquarie University, Australia; **Co-Author:**Alfredo Bautista Arellano, National Institute of Education, Singapore; **Co-Author:**Kenneth Poon, National Institute of Education, Singapore

This study fills a gap in the literature concerning the Classroom Assessment Scoring System (CLASS) by assessing its factorial structure and measurement equivalence in non-Western mainstream preschool classrooms (with normally developing children only) and special needs classrooms (children with disabilities only). Conducted in Singapore, the study aims to tease apart the equivalent and unique aspects of teacher-child interactions across diverse settings. Drawing on data from two studies involving 426 mainstream and special needs classrooms, we found support for the bifactor model of the CLASS across the two settings. Analysis of measurement invariance revealed a partially invariant metric bifactor model across mainstream and special needs classrooms. Our findings indicate that the CLASS is appropriate for use in mainstream and special needs classrooms in non-Western contexts. Domain-general and domain-specific aspects of teacher-child interactions can be identified in both settings, thus enabling future research to examine how these different aspects contribute to children's learning.

Student perceptions of testing accommodations in university mathematics: An analysis of power

Keywords: Assessment methods and tools, Higher education, Learning disabilities, Mathematics

Presenting Author:Juuso Henrik Nieminen, University of Helsinki, Finland

This study investigates the issues of power that underlie testing accommodations in university mathematics. Since testing accommodations, such as extended testing time, are known to be potentially controversial and even discriminatory, there is a need for analysis of power structures that underlie them. These accommodations, even though often based on warm-hearted intentions, are also rarely built on evidence-based practice. Three contrasting notions of power (sovereign power, epistemological power and disciplinary power) were used to analyse the experiences of the students themselves. In this study, ten mathematics students with learning and/or mental disabilities shared their experiences on testing accommodations in a semi-structured interview. A concept-driven qualitative content analysis and further data-driven coding process followed. According to the results, the students had experienced unfair and shameful moments while participating in modified testing situations, a clear manifestation of unilateral sovereign power. Forms of epistemological and disciplinary power could also be identified. This study suggests that it is crucial to hear the voice of the students who use the testing accommodations administered for them in order to shed light on the power structures that might create inequity and injustice through assessment practices.

No matter the grain size, retrieval practice promotes long term retention.

Keywords: Assessment methods and tools, E-learning/ Online learning, Educational Psychology, Learning Technologies

Presenting Author:Alice Latimier, Ecole Normale Supérieure, France; **Co-Author:**Arnaud Riegert, Didask, France; **Co-Author:**Thierry Ly, Didask, France; **Co-Author:**Franck Ramus, Ecole Normale Supérieure, France

Recent literature on interpolating retrieval practice compared two learning « grain sizes » with different learning contents: a fine grain versus a larger grain. Results in laboratory and classroom settings suggested that interspersed testing throughout the readings led to the same retention than “at-the-end of reading” questions at a final assessment whatever the retention interval. First, we aimed at comparing the effect of different grain sizes of learning periods on memory retention. Second, we wanted determine the grain size that yields the strongest testing effect at different retention intervals. Our experiment was entirely run online on a digital learning platform (Didask). We used a mixed factorial design that included 2 between-subject Learning Conditions (quiz-reading, reading-reading) and 3 between-subject Grain Sizes (small, medium, large) for the acquisition phase. During the training phase at day 1, participants had to learn from contents according to the learning conditions to which they were assigned. Seven days and 27 days later, they had to fill in a final test. We replicated the testing effect at long term intervals. Contrary to predictions, we did not find that overall performance was different between the 3 grain sizes of learning periods. However, the significant interaction suggested that the large grain size led to the best testing effect. When learning with retrieval practice, it seems that the placement of the quizzes does not matter. In contrast, when learning with reading only practice, the smallest grain seems to be better to promote retention.

Session A 13

12 August 2019 12:00 - 13:30

Seminar Room - S01

Single Paper

Teaching and Teacher Education

Teaching and Instruction

Keywords: Assessment methods and tools, Competencies, Educational Psychology, Pre-service teacher education, Primary education, Qualitative methods, Student learning, Teacher Effectiveness, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Bernadette Dilger, University of St.Gallen, Switzerland

A video portfolio instrument for the summative assessment of teacher candidates' teaching competence

Keywords: Assessment methods and tools, Competencies, Pre-service teacher education, Teaching/instruction

Presenting Author:Kerstin Baeuerlein, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

The focus on the development of competences in European educational systems consequently requires reliable competence assessments. In this context, a new instrument has been developed for the summative assessment of teacher candidates' teaching competence at the end of their studies. Candidates submit video portfolios consisting of planning documents, videos of lessons, and written analyses. Each video portfolio is assessed by two experts based on a mandatory assessment grid. The instrument is evaluated and refined continuously. For the latest version, video portfolios of 62 candidates are available. Based on these data, descriptive statistics, interrater reliability (rater agreement, intraclass correlations), and the internal structure of the assessment grid (multi-item-multi-trait method) were analysed. Descriptive analyses show a relatively little dispersion. The intended value range is not exhausted. This indicates a low level of performance-related differentiation between teacher candidates. Interrater reliability is satisfactory, but in some cases judgements vary widely. The internal consistency of the scales and subscales is high. However, the correlations between some subscales and between a lot of items of different subscales are very high, too. In line with this, a multi-item-multi-trait analysis shows that the assignment of the items to the different subscales is not always definite. Implications for the further development of the instrument include the reduction of the rating scale levels, the reduction in the total number of items and the revision of the item-subscale allocation based on the results and theoretical considerations.

Student teacher learning in teacher education: Teacher educators' and student teachers' perspectives

Keywords: Pre-service teacher education, Qualitative methods, Student learning, Teaching/instruction

Presenting Author:Auli Toom, University of Helsinki, Finland; **Co-Author:**Tiina Soini-Ikonen, University of Tampere, Finland; **Co-Author:**Janne Pietarinen, University of Eastern Finland, Finland; **Co-Author:**Kirsi Pyhälä, University of Oulu / University of Helsinki, Finland

Teacher education provides the primary learning environment for student teachers. Particularly, quantity and quality of interactions in this environment, including peers, teacher educators and pupils taught during the teaching practices, contribute to student teacher learning. However, little is known about the fit between the student teachers' and teacher educators' perceptions on the qualities of interaction facilitating student teacher learning during the teacher studies. This study aims to contribute to the gap in the literature by exploring student teacher learning embedded in student-teacher educator interaction. In addition, the fit between student teachers' and teacher educators' perceptions on student teacher learning embedded in this interaction were explored by utilizing interview data from teacher educators and primary school student teachers from a major, research-intensive university level Teacher Education Institute in Finland. Semi-structure interview data were collected from 29 Finnish teacher educators and 40 student teachers. Both interview data sets were separately content analysed by using the same analysis protocol. Results showed a misfit between perceptions and experiences of learning reported by teacher educators and student teachers. *Learning through reflecting* was emphasized by teacher educators, whereas in student teachers' descriptions *learning by direct instruction* was most often described. In teacher educators' descriptions, the emphasis was on dialogue with the students, whereas in student teachers' perspectives, the interactions initiated by the teacher educators were clearly emphasized. Moreover, different modes of learning were dominant in different qualities of interaction.

Primary teachers' understanding and practices as related to students' interest in science learning

Keywords: Primary education, Student learning, Teaching approaches, Teaching/instruction

Presenting Author:Anne-Mai Näkk, Tallinn University, Estonia; **Co-Author:**Inge Timoštšuk, Tallinn University, Estonia

The aim of our study was to explore how primary teachers' understanding of good teaching is related to their classroom practices, and students' interest in science learning. Structured interviews exploring teachers' ($n=8$) understanding of a good lesson and motivating students, classroom observations exploring teachers' practices, and students' self-reports ($n=205$) examining interest in science learning were used. We found that most teachers believe that in a good lesson, students feel a sense of accomplishment and are highly engaged. Also, teachers believe that students should be motivated by supporting their interests and by being an inspirational role model for them. Classroom observations confirmed teachers' statements about good teaching as the majority used autonomy supportive and structured teaching practices. Students' self-reports, however, revealed an overall medium interest in science learning with girls showing slightly higher interest than boys. An in-depth analysis of teachers' understanding of good teaching and practices revealed that teachers who believed a good lesson is characterised by student supportive aspects and that students' interest is enhanced by supporting their intrinsic motivation, had students with higher interest in science learning. However, not every teachers' statements were reflected in their practices. Our results point to the need to explore teachers' methods more as

it would give more information on how to improve in-service and pre-service primary teacher training, and improve students' interest in science learning.

One teacher, several classes=same instruction? Between-classes-variability of instructional quality

Keywords: Educational Psychology, Pre-service teacher education, Teacher Effectiveness, Teaching/Instruction

Presenting Author:Thamar Voss, University of Freiburg, Germany; **Co-Author:**Lisa Henke, University of Tübingen, Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:**Joerg Wittwer, University of Freiburg, Germany

Studies on the meaning of teachers' professional competence for instructional quality usually do not consider that teachers teach different classes, although empirical results indicate variability of instructional quality across contexts (e.g., Polikoff, 2015). Consequently, in the present study, we examine the variability of instructional quality between classes. We applied three-level-models (student-, class-, teacher-level) to our data of 128 teachers and their 7194 students from 416 classes. Our results indicated the existence of substantial variability of the instructional quality on the class level. Furthermore, this variability was related to teacher competence with a lower variability between classes of teachers with high competence (i.e. with higher pedagogical/psychological knowledge).

Session A 14

12 August 2019 12:00 - 13:30

Seminar Room - S13

Single Paper

Instructional Design, Learning and Instructional Technology

Instructional Design and Inquiry Learning

Keywords: Biology, Design based research, Inquiry learning, Instructional design, Knowledge creation, Learning Technologies, Mixed-method research, Primary education, Science education, Secondary education, Social sciences, Student learning, Technology

Interest group: SIG 06 - Instructional Design, SIG 20 - Inquiry Learning

Chairperson: Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary

How to guide effective student questioning?

Keywords: Inquiry learning, Primary education, Science education, Social sciences

Presenting Author:Harry Stokhof, HAN University of Applied Sciences, Netherlands; **Co-Author:**Bregje De Vries, VU University Amsterdam, Netherlands; **Co-Author:**Theo Bastiaens, Open University of the Netherlands, Netherlands; **Co-Author:**Rob Martens, Open University of the Netherlands, Netherlands

Student questioning is an important self-regulative strategy which has multiple benefits for teaching and learning. Teachers, however, need support to align student questioning to curricular goals. In a series of design based studies an principle-based scenario for the support of effective student questioning was developed in close collaboration with two development schools in primary education. In the first study, a qualitative systematic review, four design principles for teacher guidance of effective student questioning were identified in the literature. In the second design-based development study a principle-based scenario for teacher guidance was designed, implemented and evaluated on basis of these principles. A third study measured the effects of the scenario on student learning outcomes. The fourth study investigated to what extent a variety of teachers from different primary school contexts chose to adopt, reject or adapt the scenario. Findings show the scenario was not only perceived as relevant, practical and effective for teacher guidance and supported student learning outcomes in the participating development schools, but was also found to be robust in multiple settings for a variety of teachers. Neither teacher nor school characteristics were found to affect teachers implementation decisions. However, implementation seemed to be fostered by active support from school management and peers.

Impact of prior knowledge and targeted inquiry abilities on the effectiveness of explicit instruction

Keywords: Inquiry learning, Instructional design, Secondary education, Student learning

Presenting Author:Andreas Vorholzer, Justus Liebig University Giessen, Germany; **Co-Author:**Claudia von Aufschnaiter, Justus Liebig University Giessen, Germany

Promoting students' knowledge and abilities of scientific inquiry (SI) is a central goal of science education. While it is generally agreed that students may not learn SI without engaging in hands-on inquiry activities, it is not yet clear how such activities have to be embedded in instruction in order to be effective. While many studies on the subject have focused on the control of variables strategy, little is known about the effect of explicit and implicit instruction on other facets of SI and about the impact of prior domain specific knowledge on these effects. Research presented in this paper utilizes a quasi-experimental design to investigate the impact of an explicit and an implicit instructional approach on students' learning of SI three different facets of SI (formulating questions and hypothesis, planning investigations, analysing and interpreting data). Both approaches were embedded into a classroom-based intervention conducted in a German upper secondary school ($N=240$). Students' knowledge and abilities of SI were assessed before and after the intervention using a paper-pencil test instrument. Additional data was collected prior to the intervention to assess students' content knowledge. The data were analysed using ANCOVA as well as multiple linear regressions. Results indicate that the effect of explicit and implicit instructions depends on the facet of SI that is addressed. Further, linear regression analyses that both instructional approaches were equally effective for all students regardless for their prior content or SI knowledge.

Teens and Robots in Search of a Superbug - a New Approach to Authentic Inquiry

Keywords: Biology, Inquiry learning, Learning Technologies, Technology

Presenting Author:Bat-Shahar Dorfman, Weizmann Institute of Science, Israel; **Co-Author:**Amir Mitchell, University of Massachusetts, United States; **Co-Author:**Orna Dahan, Weizmann Institute of Science, Israel; **Co-Author:**Anat Yarden The Weizmann Institute of Science, Weizmann Institute of Science, Israel

Technological breakthroughs, as genomic sequencing and robotic automation, are transforming biological research. Yet, our K-12 education system remains largely oblivious of the methodologies used in research today. This further deepens the gap between school-based and authentic scientific inquiry, which may hinder scientific literacy and affect students' attitudes towards science. In this novel remote lab-evolution program we aimed to engage high-school students in authentic inquiry, focusing on an authentic challenge in medicine – the emergence of antibiotic resistant bacteria. During this 10-days program, 100 Israeli high-school students remotely activated a robotic system located in the university of Massachusetts. Guided by their teachers and the scientist who owns the robot, the students carried out a real-time lab-evolution experiment: they planned and applied different antibiotic regimens to *E.coli* cells, daily monitored their growth and changed the antibiotic regimens accordingly. To evaluate the impacts of this program on students' learning, students filled pre- and post-program questionnaires which assessed their understanding of evolutionary processes and antibiotic resistance development. The questionnaires included multiple-choice and open-ended questions. Six students were interviewed. For the 50 students who filled both questionnaires, significant differences were found between the pre- and post-program questionnaires, as well as qualitative difference. Qualitative findings suggest that students not only improved their understanding but were also engaged. This program offers a new perspective to scientific inquiry in high-school. It allows students from all over the world to be exposed to inquiry's dynamic and unexpected nature, to create a better picture of how science is actually done.

Developing Competencies for Scientific Theory Building

Keywords: Design based research, Knowledge creation, Mixed-method research, Science education

Presenting Author:Hillary Swanson, Northwestern University, United States

Theory building is central to the scientific enterprise. Students should be trained in how to do it and immersed in activities that cultivate a theoretical turn-of-mind. In this paper, I introduce a middle school science course designed to engage students in an "intellectually honest" version of scientific theory building. I present evidence that the course supported students' development of four theory-building competencies: 1) articulating consequential aspects of phenomena, 2) articulating deeper structure, 3) articulating causality, and 4) abstraction. The work contributes a new perspective on children's engagement in modes of thinking that have commonly been viewed as hallmarks of scientific expertise and beyond the capacity of young learners.

Session A 15

12 August 2019 12:00 - 13:30
Seminar Room - S16
Single Paper
Motivational, Social and Affective Processes

Attitudes and Beliefs, Motivation and Emotion

Keywords: Achievement, Attitudes and beliefs, Cultural psychology, Emotion and affect, Language (Foreign and second), Mathematics, Motivation, Motivation and emotion, Numeracy, Social aspects of learning and teaching, Student learning, Survey Research

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Eva Brante, Malmö University, Sweden

Unpacking the Female Advantage Myth in Language and Literacy: Perspectives of Parents in China

Keywords: Attitudes and beliefs, Cultural psychology, Language (Foreign and second), Survey Research

Presenting Author: Jing Li, University of Cambridge, United Kingdom

Parents stereotypically view females as better learners of foreign languages. However, less is known about 1) how parents compare typical female and male learners of foreign languages; and 2) how parents' perceptions vary among themselves. This study addressed the two research questions by a paper-and-pencil questionnaire, where participants rated a typical boy or girl's aptitude for, affection towards, and achievement in English on a 7-point Likert-scale. 1,739 parents of students from six high schools in China joined the survey, and after a three-step screening procedure, 1,530 responses were deemed valid and thus were retained for analysis. The questionnaire demonstrated strong evidence for construct validity and reliability, assessed by Principal Component Analysis and internal consistency respectively. A 2 (parent gender) × 2 (education level) × 2 (learner gender) mixed MANOVA was performed on three dependent variables (aptitude, achievement, and affect ratings). Combined, the three variables were used to examine parents' gender-stereotypical views about foreign languages. It was found that 1) parents stereotypically considered girls to be better learners of English than boys in three aspects: achievement, aptitude, and affect; 2) mothers and fathers shared similar gender stereotypes about English; 3) parents educated below degree level had stronger gender stereotypes about English achievement. These findings raised practical concerns about how the female advantage stereotype may prescribe language/literacy as feminine domains. Further research into how the female advantage myth might explain the gendered-pathways in higher education is in need.

Math, anxiety and occupational preferences association via developmental perspective

Keywords: Attitudes and beliefs, Emotion and affect, Mathematics, Numeracy

Presenting Author: Hili Eidlin-Levy, University of Haifa, Israel; **Co-Author:** Laurain Fares, University of Haifa, Faculty of Education, Israel; **Co-Author:** Orly Rubinsten, Haifa University, Israel

The current research aims to investigate the relations between general (trait) or specific (math) anxieties, math competence and math-related occupational preferences from developmental perspective. Our main interest was to study whether math and trait anxiety related differently to occupational preferences across different academic phases. Another goal was to figure out which variable in a stronger predictor of occupational preferences - anxiety level or math competence. One hundred and one middle school and 100 college students completed trait and math anxiety questionnaires. Ninth grade students also completed occupational preferences questionnaire, while actual field of study represented occupational preferences for college students. Information regarding math competence included scores in standard math fluency test for middle school students and math matriculation score for college students. Results indicated that increased anxiety levels were associated with low math competence and preference of occupations with low mathematics demands at both age groups. Furthermore, the results suggest that the association between anxiety, math competence and math - related occupational preferences change across development. General anxiety has the stronger impact on occupational preferences at early academic phase. However, math anxiety and math competence related to actual occupational choices on latter academic phase. The findings emphasize the need to develop early intervention programs, aiming to reduce both math and general anxiety levels, in order to enable young students to fulfill their occupational potential.

Can we promote adaptive reactions to academic errors? Experimental findings and implications

Keywords: Attitudes and beliefs, Motivation and emotion, Social aspects of learning and teaching, Student learning

Presenting Author: Maria Tulis, University of Salzburg, Austria; **Co-Author:** Markus Dresel, University of Augsburg, Germany

Learning from one's own errors places high self-regulatory demands on learners. Because of the emotional self-reference, learners have to (a) counteract the impending decline in motivation and maintain activating learning emotions, and (b) adapt their subsequent learning actions in order to analyse and correct their mistake effectively. In two experiments, we aimed to promote these two forms of adaptive error reactions. In Study 1 ($N = 195$) we manipulated learners' beliefs about the importance of errors for learning prior to their completion of a 50 minute learning session with error feedback, and examined the effect of the manipulation on affective-motivational adaptivity, action-adaptivity of error reactions, persistence, metacognitive learning strategies and performance. Findings from Study 1 indicate that those exposed to the negative function of errors had significantly lower action-adaptivity of error reactions, persistence, and metacognitive strategy use. In Study 2 ($N=148$) we found that those exposed to messages about adaptive error reactions differed significantly from the control group in their affective-motivational and their action adaptivity of error reactions, as well as in their beliefs about errors as learning opportunities, their persistence, and metacognitive strategy use (all in the expected direction). While we found no impact of our empirical manipulations on knowledge test performance, our results support and expand previous findings on how to promote learners' adaptive responses to errors.

Students' attributional profiles: Prevalence, development and links with motivation and achievement

Keywords: Achievement, Attitudes and beliefs, Emotion and affect, Motivation

Presenting Author: Astrid Poorthuis, Utrecht University, Netherlands; **Co-Author:** Jaap Schuitema, University of Amsterdam, Netherlands; **Co-Author:** Lisette Hornstra, Utrecht University, Netherlands

Students' causal attributions—their explanations for success and failure—are thought to be important determinants of motivation. This study aimed to identify attributional profiles (i.e., typical combinations of attributions) and to gain insight in the adaptivity of these profiles by investigating links with achievement emotions, self-esteem, school engagement, and achievement. Attributions for success and failure were assessed among 659 students ($M_{\text{age}}=12.2$ years) at three waves across one school year. Using latent profile analyses, four similar profiles were identified at the three waves. Around 50% of the participants remained in the same profile from one wave to the next and 32% during the entire school year, suggesting potential malleability. The *uncontrollable success* profile (i.e., deemphasizing effort and strategy use as causes for success) seemed most maladaptive, with students reporting lower levels of enjoyment for learning, school engagement, self-esteem and achievement and higher levels of hopelessness and test anxiety than students with the other profiles. The *controllable failure* profile (i.e., emphasizing effort and strategy use as causes for failure) seemed most adaptive but on average students did not differ significantly on most outcomes from students characterized by the *uncontrollable failure* profile (i.e., emphasizing ability as cause for failure). The *undifferentiated* profile (i.e., attributing performance equally to all causes) was related to lower levels of motivation and achievement compared to the (un)controllable failure profiles. Together, the findings suggest that it is not so much deemphasizing controllable attributions when experiencing failure, but rather when experiencing success that is most maladaptive.

Session A 16

12 August 2019 12:00 - 13:30
Seminar Room - S06
Single Paper
Higher Education, Instructional Design, Teaching and Teacher Education

Learning Approaches

Keywords: Case studies, Collaborative Learning, Competencies, Conceptual change, Experimental studies, Higher education, Instructional design, Learning approaches, Metacognition, Pre-service teacher education, Reflection, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 25 - Educational Theory

Chairperson: Koula Charitonos, The open university UK, United Kingdom

Implementing pedagogical innovation: A multiple-case study approach

Keywords: Case studies, Instructional design, Learning approaches, Teaching/instruction

Presenting Author: Irit Sasson, University of Haifa, Israel; **Co-Author:** Itamar Yehuda, Tel-Hai College, Shamir Reserach Institute - University of Haifa, Israel;

Co-Author: Shirley Miedijensky, University of Haifa, Israel

Recent years have been marked by the development of innovative pedagogical models in educational systems across the world. There is increasing need to redefine and redesign the modern education system. There is a great deal of research interest in this pedagogical change, yet there is a significant lack of studies that are focused on methods for comprehensive pedagogical characterization of the innovative learning environments. This is a multiple-case study which includes six schools that are in the process of implementing a pedagogical change focusing on the constructivist approach. In all schools, initiatives are gradually being developed and include redesigning learning spaces. The goal was to examine in each school the pedagogical practices and the development of high-order thinking skills (HOT). Characterization of teaching and learning processes was based on quantitative and qualitative tools: interviews with teachers; class observations; analysis of learning tasks; and questionnaires for students. In all case studies diversity was found in pedagogical practices and they were reconciled with the educational goals of the initiatives. Four pedagogical practices were found to be relatively common in all schools and promote active learning: cooperative and collaborative learning, integrating visual representation, adapting to differences between learners, and integrating tasks that encourage learners' choice. Nevertheless, difficulties arise in developing HOT skills, with relatively low encouragement for creative thinking, problem solving, decision making, and critical thinking. Learning tasks emphasize low cognitive complexity. The study demonstrates a pedagogical characterization of educational initiatives using several cases and hence its importance.

Exploring the material mediation of dialogic space

Keywords: Conceptual change, Learning approaches, Pre-service teacher education, Reflection

Presenting Author: Josephine Moate, University of Jyväskylä, Finland

This study addresses the crucial relationship between theory and practice as a key feature of professional learning in initial teacher education. The context for the study is an EU-funded intensive programme drawing on different dimensions of insideness and outsideness and arts-based pedagogies in response to the diversity of education today. The data for the study comes from self-selected pages from preservice teacher participants' reflective sketchbooks. As a methodological approach that unifies the sensuous and cognitive this study suggests that reflective sketchbooks document the dialogic encounters of students whilst also providing a material space that can itself become a form of dialogic space for critical reflection. The main findings of the study outline critical ways in which preservice teachers transform theoretical inputs into individual expressions as well as conceptualise theory in relation to lived experience.

Learning profiles and the (re)design of a learning environment

Keywords: Collaborative Learning, Higher education, Learning approaches, Metacognition

Presenting Author: Gerry Geitz, NHL Stenden University of Applied Sciences, Netherlands; **Co-Author:** Anouk Donker-Bergstra, NHL-Stenden University of Applied Sciences, Netherlands

Students' approaches to learning (their intentions and strategies) are known to be related to study success, well-being and employability. These approaches can be clustered in different learning profiles, which are influenced by the learning environment. In this study, learning profiles of almost 400 Bachelor students are investigated and are of importance for the (re)design of the learning environment. Results show that three clusters of learning profiles emerge: students applying either a meaning-directed, strategic or undirected approach to learning. Students of these profiles differ in their well-being. The knowledge gained in the starting phase of a longitudinal study directs the (re)design of a learning environment.

Using journal writing to support future teachers' acquisition of applicable knowledge for teaching

Keywords: Competencies, Experimental studies, Learning approaches, Pre-service teacher education

Presenting Author: Martina Graichen, University of Freiburg, Germany; **Co-Author:** Elisabeth Wegner, University of Freiburg, Germany; **Co-Author:** Matthias Nückles, University of Freiburg, Germany

To develop teaching competence, future teachers need to create coherence between content knowledge (CK), pedagogical content knowledge (PCK), and pedagogical knowledge (PK). In many teacher education programs, students have to intertwine these domains in a self-regulated manner. We investigated how journal writing can be introduced to support geography teacher students in organizing and integrating information from multiple texts to create applicable knowledge for teaching. In an experimental study (N=75), participants studied a CK-text, a PCK-text, and a PK-text (teaching of rock formation). They received either prompts that encouraged the use of intertextual learning strategies in writing a journal entry about the texts, or a modelling example of a journal entry that exemplified the learning strategies or no support for journal writing. In a transfer session, participants studied another set of texts (the teaching of volcanism) and wrote a learning journal entry about these texts. Afterwards, they evaluated the didactic quality of several visualizations of volcanism. Results showed that the number of intertextual learning strategies elicited in the journal entries was the greatest in the modelling example group followed by the prompts group and the unsupported journal writing group. A mediation analysis showed that the intertextual strategies mediated teacher students' use of information from the previously studied texts for evaluating the didactic quality of the visualizations. Evidently, supported journal writing is a promising method to facilitate teacher students' self-regulated construction of applicable knowledge for teaching.

Session A 17

12 August 2019 12:00 - 13:30

Seminar Room - S12

Single Paper

Assessment and Evaluation, Cognitive Science, Developmental Aspects of Instruction

Mathematics in Early Childhood Education

Keywords: Achievement, Cognitive development, Early childhood education, Literacy, Mathematics, Numeracy

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Andrea Haenni Hoti, University of Teacher Education of Lucerne, Switzerland

Fine motor skills and executive functions in early childhood interact to predict academic skills

Keywords: Cognitive development, Early childhood education, Literacy, Mathematics

Presenting Author: Kiat Hui Khng, National Institute of Education/Nanyang Technological University, Singapore, Singapore

Research shows that executive functions (EF) and fine motor skills (FMS) contribute to early academic skills, possibly in overlapping ways. Drawing on cognitive load theories, we examine whether and how EF and FMS interact in the concurrent prediction of math, reading and spelling skills at the start of kindergarten. Using Structural Equation Modeling (SEM) on data from a sample of 5-year-olds, we found support for a compensatory account of EF and FMS in their contributions towards math and spelling skills. Controlling for SES, age, time spent in kindergarten, and intelligence, the influence of EF on spelling achievement was larger for children with poorer compared to better FMS, and vice versa; FMS significantly predicted math achievement only in children with high, but not in children with low EF. Identifying EF or FMS difficulties at or before the start of kindergarten may be important. Different approaches to remediation involving EF

and FMS interventions may be appropriate for math versus spelling skills. We suggest that the development of FMS be included in early childhood physical activity or development guidelines, and for early childhood curricula to enhance opportunities for FMS development, especially for children who enter kindergarten with poor FMS.

Impact of Early Literacy and Numeracy on Later Reading and Mathematics Achievements

Keywords: Cognitive development, Early childhood education, Literacy, Mathematics

Presenting Author: Benő Csapó, University of Szeged, Hungary; **Co-Author:** Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:** Ágnes Hódi, MTA-SZTE, Hungary; **Co-Author:** Attila Rausch, ELTE Eötvös Loránd University, Budapest, Hungary; **Co-Author:** Gyongyver Molnar, University of Szeged, Hungary

The aim of this study is to analyze the predictive validity of school readiness assessment if broader context is taken into account. Beyond school readiness assessments, two further factors are considered: general intellectual capabilities (represented by inductive reasoning) and family background (represented by maternal education). A representative sample of primary school pupils was drawn from the first-grade school population of Hungary (at the first assessment $N=5996$, age $M=7.10$ years, $SD=.49$; 6.1% of the total school population). The tests used in this study are an inductive reasoning, an early literacy and an early numeracy test administered at the beginning of the first year and a reading and a mathematics test administered at the end of the first, second and third year. Tests were devised within and delivered by the eDia online diagnostic assessment system. The reliability of the tests (Cronbach's alpha) ranged between .75 and .94. Strong but decreasing correlations were found between the initial tests and the later reading and mathematics achievements (literacy with reading: .57, .51, .39; numeracy with mathematics: .52, .42, .29 at the end of first, second and third year). The correlations were weaker when we controlled for inductive reasoning and maternal education. The remaining partial correlations were rather small, especially in mathematics (literacy with reading: .38, .32, .15; numeracy with mathematics: .25, .22, n.s.). The results indicate that general intellectual capabilities and family background have strong stabilizing effects on school achievements and complex analyses are required when predictive validity of school readiness assessment instruments is determined.

Phonological awareness mediates the effect of SES on math achievement across the kindergarten years

Keywords: Cognitive development, Early childhood education, Mathematics, Numeracy

Presenting Author: David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:** Rebecca Bull, Macquarie University, Australia; **Co-Author:** EeLynn Ng, National Institute of Education, Singapore

Socioeconomic status (SES) is a robust predictor of math achievement. Whilst SES has been found to predict children's math achievement at school entry, and in early elementary school, it is not clear yet how SES affects math outcomes. Research aimed at understanding that relation has found that the effect of SES on children's academic achievement throughout childhood (6-15-year-olds) may be mediated by other variables. The present study investigates whether five-year-old children's phonological awareness and fluency in accessing and manipulating quantities related to Arabic numbers mediate the effect of SES on children's growth in math achievement ($N = 984$). Results of a latent growth curve model are consistent with a mediation effect on both the intercept and slope of math achievement and point to an early differentiation in phonological awareness. These findings suggest that early intervention programs, aimed at improving children's phonological awareness, may be necessary to mitigate the SES related achievement gap.

Performance to produce numerals with fingers contributes to mathematics achievement in children

Keywords: Achievement, Early childhood education, Mathematics, Numeracy

Presenting Author: Jostetxu Orrantia, University of Salamanca, Spain; **Co-Author:** Rosario Sánchez, University of Salamanca, Spain; **Co-Author:** David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:** Laura Matilla, University of Salamanca, Spain

The last few years have seen increasing interest in exploring how finger use influences children's math achievement. Some studies have focused on the relevance of gnosis, whereas other studies have explored the role of finger representations. However, no study has investigated children's ability to represent numerals with finger configurations. This is relevant as finger use is relatively frequent among children who have barely received formal math instruction. The aim of this study is to explore whether kindergarteners' skills to represent numerals with finger configurations predict mathematics achievement. Children were blindfolded, and asked to represent numerals with their fingers. Results show that the ability to represent numerals with finger configurations influences mathematics achievement beyond the effect of domain general predictors. This finding emphasizes the relevance of finger use at the beginning of formal school, and supports research showing that fingers provide a natural scaffold for mathematics.

Session A 18

12 August 2019 12:00 - 13:30

Seminar Room - S11

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Student Learning in Higher Education

Keywords: Assessment methods and tools, Attitudes and beliefs, Higher education, Learning approaches, Motivation, Motivation and emotion, Quantitative methods, Self-regulation, Student learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion

Chairperson: Mathias Mejeu, University of Bern, Switzerland

Practices of dialogic feedback across disciplines

Keywords: Assessment methods and tools, Higher education, Learning approaches, Student learning

Presenting Author: Edd Pitt, University of Kent, United Kingdom

Dialogic feedback has been suggested as a way of helping students to use feedback. How practitioners operationalise dialogic feedback in different disciplines and the subsequent effect upon students' future learning is less well understood. This paper reports on how dialogic feedback was operationalised by 11 Humanities lecturers and its effects upon first year student feedback use ($n=94$). Thematic analysis results revealed that lecturers created a learning environment and learning tasks, which encouraged experimentation and frequent opportunities to develop students' understandings, capacities and dispositions towards learning and feedback. Central to students using feedback were exposure to multiple exemplars and peer feedback throughout their course. One-way between subjects ANOVA's of the Students questionnaire responses revealed that Film students were significantly more likely to apply the ongoing dialogic feedback and felt confident applying both positive and negative feedback to their work than Comedy and Drama students. There were no significant differences between subjects in relation to student perceptions of accountability for using feedback. There were no significant differences between subjects with regards to: understanding that making mistakes was part of the learning process; students seeing their peer's work in progress helping them to understand how good their own work was; generating feedback for others helping students in their own work and seeing how their peers applied their ongoing feedback helping them in their own work. The findings suggest that future research should continue to investigate how disciplinary backgrounds influence the way lecturers operationalise and students perceive dialogic feedback.

Achievement emotions and learning in the first year at university

Keywords: Higher education, Motivation and emotion, Quantitative methods, Student learning

Presenting Author: Alexandra Corina Niculescu, University of Oslo, Norway; **Co-Author:** Dirk Tempelaar, Maastricht University, Netherlands; **Co-Author:** Mien Segers, Maastricht University, Netherlands; **Co-Author:** Wim Gijselaers, Maastricht University, Netherlands

Aiming to investigate how learning-related emotions (LREs) emerge and further develop in the first year of university, we used an integrated framework linking Pekrun's (2006) Control Value Theory of Achievement Emotions and Martin's (2007) Motivation and Engagement Wheel framework. We used a longitudinal

design and a relatively large sample ($N = 908$ freshmen) and first found that LREs are indeed contextualized experiences. Second, we showed that LREs are determined by control beliefs within the same course. Such beliefs, in turn, can influence later experiences within another course and how these experiences may change over the first year at university.

Academic self-concept, motivational regulation, and cognitive learning strategies of students

Keywords: Attitudes and beliefs, Higher education, Motivation, Student learning

Presenting Author:Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany; **Co-Author:**Annette Lohbeck, Universität Hamburg, Germany

Using a sample of 415 German university students, the present study aimed to examine the specific relations between academic self-concept, five motivational regulation strategies (interest enhancement, environmental control, self-consequating, performance self-talk, mastery self-talk), and three cognitive learning strategies (organization, elaboration, repetition). In addition, possible mediator effects of each of the five motivational regulation strategies and moderator effects of academic self-concept were explored. Results showed that academic self-concept and all five motivational regulation strategies were positively related to all three cognitive learning strategies. However, regression analysis revealed that organization was only significantly positively linked to interest enhancement, self-consequating, and performance self-talk, while elaboration was only significantly positively linked to self-consequating, and repetition was only significantly positively linked to interest enhancement and performance self-talk. Academic self-concept proved to be a significant moderator with interest enhancement for elaboration, while there were no significant mediator effects of each of the five motivational regulation strategies.

Motivation-related competences and activities university students (intend to) do to learn

Keywords: Higher education, Motivation, Self-regulation, Student learning

Presenting Author:Eva Bosch, Heidelberg University, Germany; **Co-Author:**Eva Seifried, Heidelberg University, Germany; **Co-Author:**Birgit Spinath, Heidelberg University, Germany

Motivation is a vital prerequisite for learning success in higher education. A newly introduced concept in this research area are motivation-related competences, which allow students to regulate their motivation and volition and, consequently, to achieve their goals (Schaller & Spinath, 2017). This is especially important in higher education, where students learn under little external control and have to regulate their efforts. For example, students form intentions about what to do to learn (e.g., attend lectures, form learning groups) and have to mobilize motivational resources to put these intentions into practice. In this study, we wanted to replicate the factor structure of motivation-related competences and relate them to intentions and corresponding learning activities in a lecture. $N = 226$ preservice teachers took three surveys within one semester. At the beginning, students reported high motivation, high motivation-related competences and intended to implement many learning activities, primarily specific learning for the exam. However, during the semester, students reported to have put their intentions into practice to a much lesser extent than initially intended. Students with high motivational competences were more motivated and intended to use more learning activities at the beginning. Students with high volitional competences implemented their intentions better and were more satisfied with their implementations in the middle but not at the end of the semester. Furthermore, how satisfied students were with their implementations at the end of the semester explained their performance on a mock exam. We will discuss the potential of motivation-related competences for learning in higher education contexts.

Session A 19

12 August 2019 12:00 - 13:30

Lecture Hall - H10

Single Paper

Instructional Design, Learning and Instructional Technology, Learning and Social Interaction, Lifelong Learning

Instructional Design

Keywords: Arts, Citizenship education, Design based research, E-learning/ Online learning, Educational Psychology, History, Instructional design, Learning Technologies, Literacy, Problem-based learning, Quasi-experimental research, Secondary education, Teaching approaches

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Jannis Bosch, Universität Potsdam, Germany

Development of a financial literacy-curriculum—the Effect of a Criterium-Based Construction

Keywords: Design based research, Instructional design, Literacy, Quasi-experimental research

Presenting Author:Ewelina Mania, German Institute for Adult Education, Germany; **Co-Author:**Monika Tröster, German Institut for Adult Education, Germany;

Co-Author:Prof. Dr. Esther Winther, University of Duisburg-Essen, Vocational Education and Training, Germany

The paper is discussing the conception, construction and results of a curriculum development process in the field of financial literacy. The curriculum development process is based on both the anchored instruction approach as well as a competence model for financial literacy in basic education. The questions are: Which design principles of anchored instruction have to be adapted for the learners of literacy and basic education courses? To what extent are the design principles of the anchored instruction approach applicable to the development of teaching materials for a financial literacy-curriculum? The study is based on the Design-Based Research approach and includes the following steps: needs analysis, theory adaptation, designing the implementation approach, implementation of innovation and content construction. The quality of the implementation was examined by interference statistics (ANOVA and correspondence analysis). A quasi-experimental study was conducted within the context of the educational staff training program to investigate the impact of a criterium-based content development treatment on the attitudes and the knowledge towards (1) content design principles and (2) learning processes in basic education. First examination of relationships between groups, based on ANOVA results at the .05 level of confidence, reveals the followings: (1) Significant differences were found in attitudes toward learning processes in basic education between the treatment and the non-treatment group; (2) significant differences were found in knowledge structures toward content design principles between the treatment and the non-treatment group, and (3) significant differences were found within-groups for the demographic varieties of age and work experience.

Can Digital Portrait Drawing Help to Enhance Socio-Emotional Skills of Adolescents?

Keywords: Arts, Educational Psychology, Instructional design, Learning Technologies

Presenting Author:Lydia Kastner, Leibniz Institut für Wissensmedien, Germany; **Co-Author:**Aiste Jusyte, LEAD Graduate School, Germany; **Co-**

Author:Susana Ruiz Fernández, Leibniz Institut für Wissensmedien, Germany; **Co-Author:**Sven Nommensen, Herzog Anton Ulrich-Museum, Germany; **Co-**

Author:Peter Gerjets, Leibniz Insitut für Wissensmedien, Germany

Little is known about the effectiveness of cultural-educational programs in museums and the learning processes involved. Nevertheless, many institutions claim positive effects of cultural activities (such as drawing in an art museum) on creativity and socio-emotional skills. These expectations are, however, based on limited empirical evidence. Most findings on the effects of cultural education are quasi-experimental or correlative but not experimental. In this project, the effects of drawing in an art museum on socio-emotional skills (such as emotion recognition or self-concept complexity) are examined for the first time experimentally. In an interdisciplinary approach that combines museum-educational perspectives with cognitive, social and instructional theories of psychology, we developed two psychological courses (with a focus on emotions or self-concept) that were compared experimentally to a typical course based on museum pedagogy (with a historical focus on art epochs). Our studies examined whether dealing with one of these psychological topics has stronger effects in terms of developing socio-emotional skills than dealing with art historic contents alone. In order to investigate this question, students grade of 7 to 12 took part (in two data collection phases) in a three-week course program at the Herzog Anton Ulrich-Museum in Braunschweig. In Study 1, the emotion course (and in Study 2 the self-concept course) was compared to the art epoch course. Students were randomly assigned to one of the two courses in each study. We administered pre- and post-tests to measure individual learning success with regard to socio-emotional skills and explicit knowledge of course contents.

Multiperspectivity in history textbooks. A classroom experiment

Keywords: Citizenship education, History, Instructional design, Secondary education

Presenting Author: Marc Kropman, University of Amsterdam, Netherlands; **Co-Author:** Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:** Carla Van Boxtel, University of Amsterdam, Netherlands; **Co-Author:** Marijne Scherjon, University of Amsterdam, Netherlands

Multiperspectivity is a key concept in teaching historical thinking and reasoning. History textbooks are the main source of information to teachers and students, and thereby to inform them on multiperspectivity. It is, however, not known whether presenting multiple perspectives in a textbook would result in eliciting more multiperspectivity in students' representations of the past. Our research question is: *What are the effects of a text containing multiple perspectives on students' representation of a historical topic compared to monoperspective text?* In an intervention study with four classes from four schools, within each class we randomly assigned students to one of two conditions. In the experimental condition the students were confronted with a text containing multiple perspectives; in the control condition the students were given a text with a limited perspective. In both conditions students used the text to write a summary and make a poster. We analysed the student products on elements of multiperspectivity. A One-way ANOVA showed a significant effect of the type of text on the multiperspectival representation of the student. That is to say, that students who read the text with multiple perspectives presented more multiperspectivity than students who were reading the text with one perspective. The results indicated that it is worthwhile to use history texts that are rich in multiperspectivity.

Design patterns of asynchronous online problem-based learning for professional development

Keywords: E-learning/ Online learning, Instructional design, Problem-based learning, Teaching approaches

Presenting Author: Susan Bridges, The University of Hong Kong, Hong Kong; **Co-Author:** Sdenka Zobeida SALAS PILCO, The University of Hong Kong, Hong Kong; **Co-Author:** Nancy W.Y Law, The University of Hong Kong, Hong Kong; **Co-Author:** LK Lap Ki Chan, The University of Hong Kong, Hong Kong; **Co-Author:** Ling Li, The University of Hong Kong, Hong Kong

The concept of teaching as a design science is relatively recent. Research indicates that teachers not only lack a sophisticated framework for learning design but there is also a concomitant lack of a common design language to share practices (Law, 2017). The present study explores the usefulness of a set of re-usable strategic pedagogical patterns derived from the literature on problem-based learning (PBL) in documenting and sharing PBL designs. The study was conducted in the context of an online professional development course delivered using PBL as a philosophy, design and pedagogic approach (Lu, Bridges & Hmelo-Silver, 2014). Data includes a collection of planning artefacts and follow-up interviews with the two module designers/facilitators. This exploratory study employs an iterative and recursive analysis combining theoretical and empirical approaches. Seven strategic pedagogical patterns were identified from the PBL literature: (a) identify the problem scenario, (b) identify knowledge gaps, (c) structuring ideas or hypotheses, (d) self-directed learning/independent research, (e) refine plan/hypothesis, (f) apply/implement new ideas, (g) evaluation/revision, and (h) reflection. Analysis of the online PBL course found that these patterns can be used to represent the iterative PBL cycles throughout the course. The resulting representation highlights the core structure and variations in PBL cycles, as well as make explicit the role of ICT in the design of the iterative PBL cycles.

Session A 20

12 August 2019 12:00 - 13:30

Lecture Hall - H06 - Amazon Hörsaal

Single Paper

Cognitive Science

Metacognition

Keywords: Achievement, Cognitive development, Cognitive skills, Comprehension of text and graphics, Computer-assisted learning, Learning approaches, Metacognition, Quantitative methods, Reading comprehension, Student learning, Survey Research, Teaching/instruction

Interest group: SIG 16 - Metacognition

Chairperson: Sarah Howard, University of Wollongong, Australia

Trajectories of monitoring and control in high and low performing elementary school children

Keywords: Achievement, Cognitive development, Metacognition, Reading comprehension

Presenting Author: Martina Steiner, University of Bern, Switzerland; **Co-Author:** Mariette van Loon, University of Bern, Switzerland; **Co-Author:** Natalie Bayard-Guggisberg, University of Bern, Switzerland; **Co-Author:** Claudia Roebbers, University of Bern, Switzerland

In order to encounter achievement gaps between high and low performing students, research about growth trajectories of high and low performers is needed. As monitoring and control play an important role for achievement, the present study investigated high and low performing elementary school students' growth trajectories of monitoring and control. Second and fourth graders were tested three times within a year. Each time they read different texts, answered open-ended and true-false questions, gave confidence judgments (monitoring) and regulated their performance with a maintaining/withdrawing of answers procedure (control). Results showed that students who performed low in the text comprehension test at the first measurement point also showed significantly lower monitoring and control accuracy in this test than students who performed high. However, over the two subsequent measurement points, monitoring and control accuracy of the initially low performing children increased more strongly than monitoring and control accuracy of the high performing children, so that the two groups did not differ anymore in their monitoring and control accuracy at the last measurement point. Reasons for this compensatory effect could be that initially low performing and low monitoring students have more room for improvement during the three measurement points, or that teacher became more sensitized of the importance of monitoring and control and were able to foster that, especially in lower performing children.

The Role of Cognitive Engagement on Clinical Reasoning Performance

Keywords: Cognitive skills, Computer-assisted learning, Metacognition, Quantitative methods

Presenting Author: Shan Li, McGill University, Canada; **Co-Author:** Juan Zheng, McGill University, Canada; **Co-Author:** Susanne Lajoie, McGill University, Canada

This paper explores the role of cognitive engagement on medical students' (n=88) clinical reasoning in the context of diagnosing patients in a computer based learning environment, BioWorld. A latent profile analysis was used to reveal information processing patterns in the medical students' log files for two patient cases in BioWorld. Findings from this study reveal various forms of cognitive engagement in diagnosing patient cases. Specific forms of cognitive engagement were found to influence students' diagnostic efficacy. However, different forms of cognitive engagement did not result in significant differences in diagnostic confidence. These findings inform the design of effective interventions in developing clinical reasoning skills for medical students.

Novice teachers' knowledge of effective study strategies

Keywords: Learning approaches, Metacognition, Survey Research, Teaching/instruction

Presenting Author: Tim Surma, Open University of the Netherlands, Netherlands; **Co-Author:** Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:** Renate de Groot, Open University of the Netherlands, Netherlands; **Co-Author:** Paul A. Kirschner, Open University of the Netherlands, Netherlands

Students could greatly benefit from using effective study strategies such as distributing their learning episodes over time (i.e., distributed practice) and trying to retrieve information from their long-term memory (i.e., retrieval practice). In the present study, we explored whether novice teachers are aware of these effective strategies because teachers are possibly the most important source of study strategy instruction and advice for their students. In this wide-ranging survey the recommendations and judgments of the effectivity of study strategies of more than 300 novice teachers were investigated. Participants first answered open-ended questions, followed by forced-choice items regarding seven study scenarios. Finally, they rated a list of 26 frequently used study strategies with respect to effectiveness. The results present mixed evidence for the endorsement of strategies acknowledged as effective in supporting students' study success. Several effective strategies were endorsed and frequently recommended in comparison to less effective ones (e.g., self-testing vs rereading, spacing vs massing study

sessions, dual coding vs single coding), but some (e.g., blocking practice vs interleaving practice, mind-mapping vs self-testing) were erroneously considered to be more effective. Moreover, teachers do not spontaneously recommend the most effective study strategies. Possible implications and challenges for teacher education programmes and teacher professional development programmes are discussed.

Which learner characteristics contribute to overestimations of text comprehension?

Keywords: Achievement, Comprehension of text and graphics, Metacognition, Student learning

Presenting Author:Stefanie Golke, University of Freiburg, Germany; **Co-Author:**Joerg Wittwer, University of Freiburg, Germany

A poor accuracy in monitoring and judging one's own text comprehension (i.e., metacomprehension) is a major problem in self-regulated learning because it hampers the regulation of study and can produce underachievement. Learner characteristics are repeatedly assumed to account for poor metacomprehension accuracy. However, there is a lack of studies that address several learner characteristics simultaneously. In the present study ($N = 195$ university students), we, therefore, investigated metacomprehension accuracy in terms of over- and underestimation as a function of several learner characteristics regarding cognitive, metacognitive, and motivational characteristics as well as personality traits. Results from hierarchical regression analyses showed that higher overestimation of factual questions about the texts was significantly associated with a lower reading skill and a higher tendency towards self-enhancement. For inference questions, higher overestimation was significantly related to a lower reading skill and to a higher self-reported use of general monitoring strategies. The findings suggest that a lower reading skill contributes to a stronger overestimation because it hampers deep text processing and, hence, yields less representation-based judgment cues. Another aspect of lower reading skill might be a limited understanding of what comprehension (monitoring) actually means, which could explain the finding that a higher self-reported use of monitoring strategies contributed to stronger overestimations. With regard to the effect of self-enhancement tendencies, it can be discussed whether self-enhancement is applied deliberately and, if so, whether learners using them are aware of their overestimations.

Session A 21

12 August 2019 12:00 - 13:30

Seminar Room - S10

Single Paper

Developmental Aspects of Instruction

The Crucial Skills of Executive Functions and Attention in the First Swedish Preschool RCT Study

Keywords: Assessment methods and tools, Cognitive development, Cognitive skills, Conversation/ Discourse analysis, Early childhood education, Educational Psychology, Experimental studies, Language (L1/Standard Language), Learning approaches, Neuroscience, Quantitative methods

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Isabelle Skakni, United Kingdom

The background of the first evidence-based Swedish preschool study and educators' reception

Keywords: Conversation/ Discourse analysis, Early childhood education, Educational Psychology, Learning approaches

Presenting Author:Hillevi Lenz Taguchi, Stockholm University, Sweden

Swedish preschools enroll 84 percent of one- to three-year-olds and 95 percent of four- and five-year olds in full-day *Educare* practices. The paper's aim is to analyze the scientific and historical context of Swedish preschool and reasons for the lack of interest in evidence-based practices; as well as the educator reception of the recently performed *first* intervention RCT study in Swedish preschool. In the test-averse context of preschool, research and practices, we conducted an intervention study involving 432 children and 98 educators. The – with stakeholders – negotiated aim was to evaluate an enhanced version of a well-established group-based learning strategy, to be compared with a contrasting individualized attention-training intervention and controls. Methodologically the paper entails text analyses of i) texts relevant to the decisive scientific split emerging between psychology and pedagogy, with consequences for didactic preschool practices, ii) focus-group interviews with all educators participating in the RCT study. The results show i) how practices have shifted from relying on psychological knowledge to build their practices on sociocultural, sociological, social constructionist and critical theories; ii) educators appreciated the insights from findings in the developmental sciences as enacted in the two interventions. Educators prized the importance of the researcher-stakeholder bidirectional engagements as effects of the transparency of the RCT design and the continuing collaborations. Significance: Intervention studies make possible deep-loading collaborations in the framework of evidence-based research, when using multiple and mixed methods in a continuing collaboration. Such studies have the potentials of enhancing preschool-didactics and strengthening the future quality of services.

Set-up, hypotheses, and results from an RCT-study in Swedish Preschools

Keywords: Assessment methods and tools, Experimental studies, Learning approaches, Quantitative methods

Presenting Author:Tove Gerholm, Stockholm University, Sweden; **Co-Author:**Hillevi Lenz Taguchi, Stockholm University, Sweden; **Co-Author:**Sofia Frankenberg, Stockholm University, Sweden; **Co-Author:**Petter Kallioinen, Stockholm University, Sweden; **Co-Author:**Signe Tonér, Stockholm University, Sweden; **Co-Author:**Susanne Kjällander, Stockholm University, Sweden; **Co-Author:**Anna Palmer, Stockholm University, Sweden

The aim of this intervention study was to test a well-established group-based learning strategy, methodologically set up as a three-armed cluster randomized control study. Some 400 children were randomized on the level of preschool unit. The interventions were either a boosted version of a group-learning strategy, *Socio-Emotional and Material Learning* (SEMLA), involving each child for 1 ½ hrs./day in investigative learning-processes focusing on early mathematics; the contrasting intervention, *Digital Individual Learning for Body & Mind* (DIL), featured an individual computerized interactive mathematical learning-game, combined with a number of attention-enhancing physical exercises, during 20-30 min/day; or the control group who had business as usual. The main hypotheses were: Do children who are exposed to supervised group-learning aimed at training basic socio-emotional skills develop attention, social understanding, communication and language skills to a significantly higher degree than children who have followed an alternative computerized attention training program or those who have not been exposed to any of these practices? Are there any differences between boys and girls and between children from different socioeconomic backgrounds? The effect of the intervention was calculated on the difference between pre and post testing of selective attention, executive function, language and communication, socioemotional skills and early math skills. The preliminary results indicate no statistically significant outcome measures of the interventions. However, the relation between preschool quality and interventions were significant, a result that will be elaborated on in the discussion.

Language, selective auditory attention and executive functions in Swedish preschoolers

Keywords: Cognitive development, Language (L1/Standard Language), Neuroscience, Quantitative methods

Presenting Author:Signe Tonér, Stockholm University, Sweden; **Co-Author:**Tove Gerholm, Stockholm University, Sweden

Language, attention and executive functions (EF) in early childhood are important for a wide range of future outcomes. However, little is known about these skills within the Swedish context, where a majority of children attend preschool from an early age. The aim of this empirical study was to investigate potential relationships between language, attention and EF skills and background variables such as age, sex and socioeconomic status (SES) in 393 Swedish preschoolers aged 4-6. This study is part of a larger intervention RCT study which evaluated the effects of two learning-paradigms – one group-based and one individual – performed with 432 children, their families, 98 educators at 29 preschool units. The methods of data productions were behavioral tests, including a narrative assessment, parental questionnaires and an event-related potential paradigm measuring neural activity during a dichotic listening task. Results: There was a small but significant difference in EF, where girls performed higher than boys, and we also revealed differences between girls and boys on some, but not all, language measures. For selective auditory attention, there was a significant effect of SES. Significance: Investigating language in more detail than many previous studies may reveal a more comprehensive understanding of child language skills, with theoretical implications for understanding the connection between language and EF. Furthermore, the results concerning relationships between language, attention, EF and age, sex and SES provide guidance for future research and practice with the common goal to provide all children with a solid foundation for lifelong learning.

A pop-up brainwave lab at Swedish preschools – measuring brain function for selective attention

Keywords: Cognitive development, Cognitive skills, Experimental studies, Neuroscience

Presenting Author:Petter Kallioinen, Stockholm University, Sweden; **Co-Author:**Signe Tonér, Stockholm University, Sweden

Selective attention is both important for cognitive development and malleable, making it a potentially central measurement in intervention studies of preschool children. The aim of the paper is to discuss the experiences from a large-scale intervention study, evaluating the effects of two pedagogical interventions: one group-based and one individual, to be compared with controls. The study constitutes the first RCT study in decades in Swedish education research. The methods entailed pre- and post-testing, including measuring selective attention, using event-related potentials (ERPs). In bringing cognitive neuroscience methods to Swedish preschools we faced challenges related to the field acquisition of sensitive data as well as challenges related to what has been described as test averseness among Swedish educators. We addressed concerns from educators, caregivers, and children by adapting our communication and implementing the concept of informed consent carefully to each group. The ERP paradigm we used was adapted for young children and translated into Swedish, and asked children to selectively attend to one of two pre-recorded children's stories played simultaneously while ignoring the other story (Coch et al., 2005). We measured ERPs to probe sounds embedded in the stories and found larger responses to attended probes, compared to unattended probes, consistent with previous studies (e.g., Coch et al., 2005). Our results contribute to our understanding of brain mechanisms supporting selective attention, a valuable skill for success in school, and provide an important baseline to assess how these mechanisms are affected by different educational approaches.

Session A 22

12 August 2019 12:00 - 13:30

Seminar Room - S05

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Attitudes, Beliefs and Achievement

Keywords: Achievement, Attitudes and beliefs, Citizenship education, Out-of-school learning, Quantitative methods, Science education, Secondary education

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 13 - Moral and Democratic Education

Chairperson: Floris van Blankenstein, Netherlands

Gender-science stereotypes: The secret participants in science competitions

Keywords: Achievement, Attitudes and beliefs, Out-of-school learning, Science education

Presenting Author:Anneke Steegh, Kiel University, Germany; **Co-Author:**Tim Hoeffler, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Ilka Parchmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

The gender distribution of participants in the first round of the German Biology Olympiad (IBO), Chemistry (IChO) and Physics (IPhO) Olympiad is uneven (mostly females in the IBO, mostly males in the IPhO and about equal numbers of males and females in the IChO). Eccles' et al. (1983) expectancy-value model of achievement motivation explains a student's science achievement and achievement-related choices, which are shaped by factors that are influenced by gender-science stereotypes. Gender-science stereotypes have been found to influence males and females differently. We therefore compared the influence of these stereotypes on participation and achievement in three German student Science Olympiads. Participants in all Olympiads were found to associate science with male attributes. The endorsement of this gender-science stereotype was strongest among Physics, and weakest among Biology Olympiad participants. We used multi-group structural equation modelling to investigate the influence of gender-science stereotypes on students' participation and achievement through science-related self-concept, topic interest and attainment value. Unmediated associations between gender-science stereotype endorsement and the participation and achievement outcome variables showed large differences between the three Olympiads. The mediated model showed specific indirect effects for females in the IChO between gender-science stereotypes and willingness to participate in the next competition through topic interest and attainment value. Further research is needed to find specific influences of stereotypes on both males and females in the different science competitions.

Young people's view on Democracy: a latent class analysis in Flanders considering civic knowledge

Keywords: Attitudes and beliefs, Citizenship education, Quantitative methods, Secondary education

Presenting Author:Ellen Claes, KU Leuven, Belgium; **Co-Author:**Dimokritos Kavadias, Vrije Universiteit Brussel (VUB), Belgium

Young people are the key to well-functioning future democracies. Political socialization research has shed light on different forms of civic and political participation in adolescence, and documented the key-role of schools and teachers in this socialization-process. At the same time, this strand of research does not inform us properly about what this exactly means for democracy. In this article, we are assessing young people's differences in views on democracy by considering their scoring patterns via a latent class analysis (LCA) on good/bad democracy items in the ICCS 2016 study (an international study into civic and citizenship education of 14-year-old students). We use the Flemish sample (n=2914) of 8 graders. The analysis extracted four homogenous latent classes of pupils, using seven items pertaining to the evaluation of institutional aspects of representative democracy. A preliminary analysis already points to significant differences between the 'Monitorial', 'Main Stream Active', 'Law Abiding' and 'Ademocratic' classes, in degrees of civic knowledge concerning democratic politics. We aim to look into the background characteristics of the different groups to assess if the tendencies to reject the principles of democratic institutionalized politics can also be related to aspects of civic education as perceived by the students, or as provided by the schools.

Young critical citizens? Predicting trust in political institutions among 14-year old students

Keywords: Achievement, Attitudes and beliefs, Citizenship education, Quantitative methods

Presenting Author:Johanna Fee Ziemes, University of Duisburg-Essen, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

How critical is the perspective of students towards political institutions? Norris (2011) stresses the importance of critical citizens for democracies, but when and how do students turn critical? Lauglo (2013) showed that students with high civic knowledge award trust differently than their peers with less civic knowledge and that this effect is influenced by characteristics of state functioning for instance measured by the Corruption Index or the Human Development Index. Using ICCS 2016 data this paper investigates the relevance not just of civic knowledge but also of other variables such as the socioeconomic status and opportunities to learn about politics and national identity for the prediction of trust in political institutions and compares the results among 24 educational systems. Two countries will be analysed in depth to achieve a deeper understanding of students assessment of institutions' trustworthiness. Results replicate the relevance of civic knowledge for the development of trust, but also show the effect of other non-cognitive predictors.

The good disobedient citizen. The relation of civic knowledge to concepts of ideal citizenship

Keywords: Achievement, Attitudes and beliefs, Citizenship education, Quantitative methods

Presenting Author:Katrin Hahn-Laudenberg, University of Wuppertal, Germany; **Co-Author:**Vegard Svagård, OsloMet – Oslo Metropolitan University, Norway

The paper will investigate to what extent students integrate attributes of civil disobedience in their concept of good citizenship. Civil disobedience has been discussed as an element of critical (Norris, 1999), social justice oriented (Westheimer & Kahne, 2004) or transformative (Banks, 2017) citizenship. Following these conceptions, the paper hypothesizes a positive correlation of a preference for civil disobedience to civic knowledge and attitudes towards human equality. However, results do not verify these considerations for 14-year-old students in Norway and North-Rhine-Westphalia. Analysis shows negative relations between on the one hand civic knowledge as well as attitudes towards gender equality and on the other hand an inclination for civil disobedience. Consequences for the theory of critical citizenship and civic and citizenship education will be discussed.

Session B 1

12 August 2019 13:45 - 15:15

Lecture Hall - H11

SIG 7: Using today's technology to improve learning and performance in (complex) professions

Keywords: Educational technology, Instructional design, Lifelong learning, Reasoning, Technology, Workplace learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Margot van Wermeskerken, Netherlands

Chairperson: Milou van Harsel, Netherlands

Discussant: Martin Merkt, Germany

In order to gain expertise in complex domains, establishing authentic learning situations is crucial. Authentic learning situations provide learners with the opportunity of solving complex real-world problems and practice the knowledge and skills that are relevant to real-life situations. However, in some professions (e.g., in the medical domain or on construction sites) creating such authentic learning situations may be difficult or may come with a certain risk (e.g., safety of patients or workers at construction sites). Thanks to the rapid developments in technology (i.e., virtual reality and simulation technology), it is possible to offer learners in such domains with near-authentic learning situations to train particular skills in a controlled manner. It is, however, still an open question how these technologies should be used to improve learning or enhance consciousness of real-life situations. The presenters of this invited SIG 7 symposium address this question. The first contribution by Fischer addresses the potential of virtual patients in medical education. The second contribution by Van Merriënboer investigates the transfer from simulation-based training in a clinical setting to clinical practice. The third contribution by Gruber et al. investigates the relation between technical skills and non-technical skills in the medical domain using simulations. The final contribution by Kollöffel makes use of VR to improve safety management in construction sites. Finally, Guido Makransky will wrap-up the symposium in his discussion. Note that this symposium is linked to the invited SIG 6 symposium that focuses on instructional interventions regarding skills relevant for successful performance in (complex) professions.

Virtual patients in medical education: Instructional bonanza for clinical reasoning?

Presenting Author: Martin R. Fischer, University Hospital of LMU Munich, Germany

Clinical reasoning is an important competence for physicians. A sound biomedical knowledge base and analytical and non-analytical problem solving strategies have to be applied to diagnose patients conditions. Diagnostic errors are frequent and are a major challenge of medical education. Faulty context generation and premature closure are major sources of diagnostic error in medical students. Virtual patients (VPs) provide a safe and standardized learning experience to foster clinical reasoning. This paper summarizes what is known about the features of VPs that contribute to improved clinical reasoning outcomes. The effects of case format, erroneous cases, and various forms of scaffolding on cognitive load, diagnostic accuracy, and diagnostic efficiency will be reported. A framework for the assessment of the learning process and outcome measures of clinical reasoning will be proposed.

The use of simulation-based training for lifelong learning in health professions

Presenting Author: Jeroen Van Merriënboer, Maastricht University, Netherlands

Today's health professionals are required to be lifelong learners so that they can continuously adapt to fast changes in available medical knowledge, technologies, and guidelines. A lack of continuous adaptation to new work requirements jeopardizes the quality of care and patient safety. The goal of this presentation is to discuss research projects on the use of simulation-based training for promoting lifelong learning. All these projects use the four-component instructional design (4C/ID) model as their theoretical basis. Future and current changes in the medical environment are then directly brought into simulation-based training so that health professionals can practice with new technologies and competencies before using them in clinical practice. The projects fall in three categories. First, they study the effects of applying 4C/ID-guidelines on transfer from simulation-based training to clinical practice. Second, they study the effects of deliberately mixing learning tasks performed in a simulation-based training setting with related professional tasks performed in clinical practice (e.g., double-blended learning). And third, they study the effects of using participants' 'critical incidents' in clinical practice as a basis for the design of learning tasks in simulation-based training. Overall, the projects show that transfer from simulation-based training to clinical practice in the context of lifelong learning is not easy to realize but requires a careful instructional design that considers both transfer from simulation to the workplace and from the workplace to simulation.

Simulation-based learning of non-technical skills in medicine

Presenting Author: Hans Gruber, University of Regensburg, Germany; **Co-Author:** Thomas Bein, Faculty of Medicine, University of Regensburg, Germany; **Co-Author:** Michael Henninger, Department of Media Didactics, Pädagogische Hochschule Weingarten, Germany; **Co-Author:** Matthias Jacob, Department of Anesthesiology, Intensive Care Medicine and Pain Medicine, Brothers of Mercy Hospital St. Elizabeth, Straubing, Germany

Medical expert action requires both technical skills (TS) and non-technical skills (NTS). Whilst most medical curricula focus on TS, evidence exists that many errors result from lacking NTS. NTS may comprise the communication between members of different professions in medical teams (e.g., surgeons, anaesthesiologists, nurses) or task management in resuscitation teams. Expertise research has mainly investigated cognitive adaptations concerning the medical knowledge, i.e., TS and the underlying biomedical knowledge. It is a major challenge how to appropriately address NTS in research on professional learning in medicine. High-fidelity full scale simulations offer good opportunities to create close-to-authenticity situations in learning in which NTS can be observed and improved through instruction. In this contribution, the occurrences of NTS problems and the affordances of complex simulations to tackle these problems are reviewed in order to better understand and to foster NTS. Empirical data from two larger sets of studies are used that addressed learning and acting in simulated scenarios of communication in the operation theatre or in intensive care units and of task management in resuscitation in mountain rescuing. In both sets of studies, observational methods and survey and testing techniques are used to analyse the role of NTS in routines, in schema-based actions under unexpected circumstances, and in the dealing of errors. Based on these analyses, the potential is explored of the instructional methods of briefing and debriefing before and after the participation in simulations.

Taking workplace safety at construction sites to greater heights: VR training for scaffolders

Presenting Author: Bas Kollöffel, University of Twente, Netherlands

One of the key factors in safety at construction sites is the employees' ability to identify possible risks and hazards at the workplace. This ability is acquired through experience and training, although researchers question the effectiveness of conventional safety training. Virtual Reality (VR) training provides opportunities to train operatives at construction sites to identify risks and hazards, to intervene, to help to prevent accidents, and to improve site safety in the future. VR learning environments offer a safe environment to experience unsafe situations and to train operatives to identify risks and hazards, to intervene timely and adequately in case of such risks or hazards, and to stimulate the employees to contribute to even safer working conditions in the future, for example by recognizing the importance of reporting (near-)accidents at the workplace. The study reported here, investigated the use of a VR safety training from different angles. First, the attitude of professional scaffolders towards a VR safety training was assessed. The results showed a strongly positive attitude of the scaffolders towards the VR training. The second angle focused on the participants' readiness to intervene in case of hazards and to prevent accidents from happening. The results showed a significant increase in their readiness to intervene. The third angle was to assess the willingness of scaffolders to report (near-)accidents. After the VR training, participants show a highly significant increase in their willingness to report (near-)accidents in order to prevent accidents from happening in the future.

Session B 2

12 August 2019 13:45 - 15:15
Lecture Hall - H07
SIG Invited Symposium
Higher Education

SIG 4: What features of instruction promote higher education students' interest in their subject?

Keywords: Emotion and affect, Higher education, Instructional design, Motivation, Science education, Teaching/instruction

Interest group: SIG 04 - Higher Education

Chairperson: Kathleen M. Quinlan, University of Kent, United Kingdom

Discussant: Sari Lindblom, University of Helsinki, Finland

While some teachers think students are either interested in their subject or not, interest is not immutable. Students' interests can be stimulated, nurtured and developed by teachers, instructional activities, fellow students, and other aspects of the environment. Doing so is vital to education because a person's interest affects their attention, goals, ability to self-regulate, study strategies, and attainment (Renninger & Hidi, 2016; Rotgans & Schmidt, 2011a). Interest is conceptualised as focused on some content or object, developing through person-environment interaction, consisting of cognitive and affective dimensions, and intrinsically rewarding (Panksepp, 1998; Renninger & Hidi, 2011; Renninger & Hidi, 2016). Although most research focuses on children's interest, understanding how students' interests relate to the particular affordances of higher education (HE) settings is required to design learning environments that support interest-driven engagement. Yet, attention to the situational variables that trigger or sustain interest in HE is limited. Research with undergraduates suggests the importance of perceived usefulness (Hulleman, Godes, Hendricks, & Harackiewicz, 2010), appropriate challenge (Dohn, Madsen, & Malte, 2009), problem-solving (Rotgans & Schmidt, 2011a), access to advanced technologies (Nieswandt & Horowitz, 2015) and teachers' perceived personal concern, subject-matter expertise and ability to explain content (Marjoribanks & Mboya, 2004; Rotgans & Schmidt, 2011b). This symposium demonstrates the importance of interest and its potential to impact curricular and instructional practice. The first paper examines student interest in the context of overall programmes while subsequent papers identify instructional features associated with students' interest in particular settings, including lectures, lab practicals, and co-curricular enrichment activities.

How interest and other domain values develop in five disciplines over three years

Presenting Author:Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Silja Silvano, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Interest is one of the best predictors of academic achievement of Finnish university students (Mäkinen, Olkinuora & Lonka, 2004; Ketonen et al, 2016; Heikkilä & Lonka, 2006; Lindblom-Ylänne & Lonka, 1999; Nieminen, 2011). In addition to intrinsic interest, students may also value studying a subject because it is personally important to do well (attainment value) or because it is useful (utility value) (Eccles et al., 1983; Eccles & Wigfield, 2000; Eccles, 2009). In this longitudinal study, we look at a) relationships among students' domain values and students' perceived difficulty of their major subject in the first year; b) how those values develop over the first three years of university and; c) differences across five disciplines (teacher education, chemistry, law, theology and engineering). 498 students participated in year 1. 210 continued through the three-year follow-up. Domain values were measured by a 7 point Likert scales derived from the expectancy-value model (Eccles & Wigfield, 2000). Task difficulty was measured with two items. ANOVAs were used to determine differences and structural equation modelling was used to explore within-person relationships between different task values. There were no significant correlations between domain value and task difficulty. Domain value (importance, interest, utility) decreased significantly in year two, but increased again in year three. Task difficulty did not change during the three years. There were significant differences between disciplines, which will be discussed in relation to entry standards and the nature of the curriculum. Within-persons utility value and interest appear to have a reciprocal relationship.

What triggers students' situational interest during higher education lectures?

Presenting Author:Kathleen M. Quinlan, University of Kent, United Kingdom

Lecturing is often touted as a means to inspire students' interest, despite evidence that most lectures fail to do so. Drawing on Renninger & Hidi's (2011; 2016) conceptualisation of situational interest, this study examines triggers of students' interest during lectures. Students (N=706) in 12 different individual one hour first year lectures in a UK university were surveyed at the end of the lecture. They described the moment they were most interested; rated a series of 5 point Likert scale items on their situational and individual interest, and features of the content, presentation and teachers' behaviour during that moment; and provided demographic characteristics. Regression analyses showed that novelty, cognitive activation, cognitive incongruity, and utility value all positively predicted situational interest. Students' perceptions of their teachers' enthusiasm, approachability and knowledge was the strongest predictor of situational interest. Overchallenge was negatively associated with situational interest.

Students' interest in tertiary science education laboratory

Presenting Author:Niels Dohn, Aarhus University, Denmark

The laboratory has a central and distinctive role in tertiary science education. This paper describes two different studies on students' interest. Both studies are based on the same methodology; observations, informal conversational interviews, and questionnaires. The aim was to identify sources of interest. In Study 1, we investigated sources that stimulate the interest of students in an undergraduate course in animal physiology. Triggers for interest were live animals, aha-experiences, meaningfulness, social involvement, humor, and background knowledge. Except for the last one, these triggers are all situational variables that are largely under control of teachers and should be considered when planning instruction. In Study 2, two different approaches to lab work in undergraduate physics were compared: a cook-book style approach versus an open inquiry-based one. Preliminary results indicate that students are more interested in inquiry-based lab activities, but experience more uncertainty due to the openness of lab tasks. This finding points to the need for scaffolding in terms of guided inquiry to make students feel more secure.

Interest and added value: Participation in both laboratory research and concurrent STEM teaching

Presenting Author:K. Ann Renninger, Swarthmore College, United States; **Co-Author:**Yoi Tibbetts, University of Virginia, United States; **Co-Author:**Jena Gilbert-Merrill, Swarthmore College, United States

Many undergraduate programs provide opportunities for students to work alongside researchers in scientific inquiry. This study was designed to address professors' questions about whether students with developed interest should be the only ones encouraged to work as research assistants, and if concurrent science activity such as assisting in a science workshop for 10-12-year-old youth provides their research assistants with added value. Online questionnaires and follow-up in-depth semi-structured interviews were conducted with 40 (20 M, 20 F) higher education students and recent graduates from one institution, half of whom worked alongside an academic in a science or engineering research laboratory and concurrently assisted in an out-of-school science workshop. The other half of the participant group assisted in a research laboratory, but not in the concurrent science teaching activity. Findings suggest that students with more versus less STEM interest engaged with research in the laboratory differently, and that having a more developed interest was beneficial. Findings also indicated that there was added value for all students who participated in concurrent science-related activity in addition to laboratory research. Even if students started out working in a laboratory with less developed interest, concurrent science participation contributed to the development of their interest, as well as to the likelihood that they would continue to pursue STEM course work and/or jobs following graduation. Instructional implications of this study will be discussed, including how to tailor mentoring and support for students based on their level of interest.

Session B 3

12 August 2019 13:45 - 15:15

Lecture Hall - H05

Invited Session

Motivational, Social and Affective Processes

EFG: The potential of biophysiology for understanding learning and teaching experiences

Keywords: Biology, Emotion and affect, Motivation and emotion, Quantitative methods, Teaching/instruction

Interest group:

Chairperson: Tim Mainhard, Utrecht University, Netherlands

Organiser: Tim Mainhard, Utrecht University, Netherlands

Discussant: Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany

This Emergent Field Group is interested in the potential role of biophysiology (e.g., heart rate, cortisol, electrodermal activity, physical activity and rest) in educational contexts. We are also interested in the a "processperspective" (cf. intraindividual, within-person) on educational processes. Modern technology affords user-friendly and cost-efficient ways of collecting objective measures of biophysiology using unobtrusive wearable devices. The promise of such objective biophysiological measures is that - relative to existing "classic" approaches - they are considered more unbiased, allowing researchers to track processes as they occur in real time. Importantly, innovations make it possible to take traditional lab-based biophysiological measures into real educational settings. The first study, looking into teacher occupational stress, showed that teachers' cortisol levels were scarcely related to self-reported stress and burnout. Positive school climate, however, indicated healthier cortisol levels. The second study examined the hypothesis that the specific nature of teachers' physiological response, in terms of heart rate, in high arousal classroom situations (i.e., challenge versus threat response) predicted more or less adequate interpersonal teacher behaviour. The third study compared several components of anxiety and showed that worry is the most pronounced mediator, while skin conductance (SC) played an important role in the control-performance association too. The third study explored variability in SC as student responses to lecture formats in university. Within and between lesson variability accounted for most of the variance (each 42%) while between student variability was low. Presentations and discussion pay specific attention to the promises and challenges of biophysiological measures in educational research.

Salivary cortisol in teachers' stress research - correlates, pitfalls and promises

Presenting Author: Anna-Liisa Jögi, University of Jyväskylä, Finland; **Co-Author:** Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:** Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Teachers' physiological stress is receiving increased attention in teachers' well-being and teacher-student interactions research. Self-perceived stress may not always correlate with physiological stress. Therefore, it could be beneficial to search for factors that protect teachers from severe physiological stress. Using salivary cortisol as an indicator of physiological stress is widely emerging in the field of educational studies. The preliminary results of Teacher and Student Stress and Interaction study are presented focusing on correlates of physiological stress and self-reported stress, burnout, self-efficacy and perceived school climate, as well as possible pitfalls when using psychophysiological measures in educational research. The results revealed that physiological stress was scarcely related to self-reported stress and burnout. Positive school climate, however, indicated healthier cortisol levels. Pitfalls of using psychophysiological data were mainly related to data collection and management. The upside of using psychophysiological measures in combination with self-reports is promising for trait variability research and exploration of the impact of context using longitudinal methods. Psychophysiological data could provide more objective information regarding changes of individual's stress, which might be beneficial for intervention planning on teacher stress reduction and wellbeing.

A high heart rate during teaching: Indicator of challenge or threat?

Presenting Author: Tim Mainhard, Utrecht University, Netherlands; **Co-Author:** Monika Donker, Utrecht University, Netherlands; **Co-Author:** Nora McIntyre, University of York, United Kingdom; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Teaching, and interpersonal processes involving students in particular, can be experienced by teachers both as a challenge or a threat. Whether teachers' interpretation of a specific classroom situation resembles a challenge or threat interpretation is supposed to depend on teacher interpersonal self-efficacy and is expected to predict teachers' specific interpersonal reactions. Different physiological responses are expected to underlie a challenge or threat interpretation. The present study investigates how teachers with different levels of self-efficacy differed in their physiological and behavioral reactions during particularly stress-full classroom situations. For eighty teachers on average nine stressful situations (as indicated by an elevated heart rate, +2SD) were examined. Results showed that teachers had on average a high heart rate during situations where they were more dominant than their students (e.g., situations where they took the lead) and were they showed as compared to students a higher friendliness (e.g., teachers remained friendly while students were hostile). Physiologically, teachers' exhibited both challenge and threat responses during stressful situations, which could be partly explained by their general self-efficacy. The current may ultimately help to pinpoint difficult classroom situations during teaching and to give concrete suggestions for improvement.

The control-anxiety-performance relationship: self-report and physiological measures

Presenting Author: Anna-Lena Roos, University of Konstanz, Germany; **Co-Author:** Thomas Goetz, University of Konstanz, Germany; **Co-Author:** Maike Krannich, University of Zurich, Switzerland

Although theoretically anxiety constitutes of multiple components (e.g., cognitive, affective, motivational, and physiological components), previous empirical studies largely neglected to examine them separately. Thus, it remains unclear whether all of the anxiety components are equally important when looking at the connection of control and performance mediated by anxiety - as proposed by Pekrun's highly acknowledged control-value theory (CVT). Furthermore, most research on anxiety in educational psychology relies on self-report measures which can be biased in certain ways (e.g., by memory effects or subjective beliefs). Therefore, this intra-individual study investigated the different anxiety components in the framework of the CVT in a sample of $N = 50$ German 8th graders and had the goal to identify the component that is most important in the mechanism that connects control and performance and should therefore be central in anxiety interventions in order to increase students' performance. In addition to self-reports, the physiological anxiety component was examined with physiological measures (i.e., skin conductance; SC assessed with Empatica E4 wristbands) to provide an objective assessment. All study variables (i.e., control, anxiety components, SC, and performance) were collected at multiple times during a mathematics test. Results showed that the cognitive anxiety component seems to be central for student's performance and consequently suggest that it is important to distinguish between the components. Additionally, we found a positive relationship between control and SC, which will be discussed in more detail.

Bio-Psychological Factors Implicated in Fear of Failure and Test Achievement in Science

Presenting Author: Emma Burns, University of New South Wales, Australia; **Co-Author:** Andrew Martin, University of New South Wales, Australia; **Co-Author:** Roger Kennett, University of New South Wales, Australia; **Co-Author:** Joel Pearson, University of New South Wales, Australia; **Co-Author:** Marianne Mansour, University of New South Wales, Australia; **Co-Author:** Brad Papworth, University of New South Wales, Australia; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom

Theory and research have identified that fear of failure can lead to different achievement outcomes: sometimes it is associated with lower achievement and sometimes it is associated with higher (or equivocal) achievement. Given that fear has distinct physiological implications, this study explored bio-psychological factors as a means of gaining further clarity as to how it is associated with test achievement. Specifically, we examined the role of sympathetic arousal (as measured by electrodermal activity; EDA, also known as galvanic skin response) in mediating the link between fear of failure and test achievement in science. While completing a science test, a sample of 156 high school students wore a biometric wristband that collected EDA signals. Data were also collected on students' fear of failure via an online survey. We assessed the role of fear of failure in predicting EDA and the role of EDA in predicting test achievement. Findings showed that fear of failure predicted higher levels of EDA and higher levels of EDA predicted lower achievement. Thus, accounting for bio-psychological processes in a psycho-educational study of motivation and achievement helped clarify how students' fear of failure is implicated in their academic development.

Session B 4

12 August 2019 13:45 - 15:15

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Invited Session

Teacher dashboards for orchestration of the classroom: the role of teacher characteristics

Keywords: Computer-supported collaborative learning, Higher education, Learning analytics, Primary education, Teaching/instruction, Technology

Interest group:

Chairperson: Nikol Rummel, Ruhr University Bochum, Germany

Organiser: Anouschka van Leeuwen, Utrecht University, Netherlands

Organiser: Nikol Rummel, Ruhr University Bochum, Germany

Discussant: Susan Goldman, University of Illinois at Chicago, United States

Teacher dashboards are visual displays that provide teachers with information about their students, for example, concerning students' progress and performance on tasks during lessons or lectures. Teacher dashboards can aid teachers in orchestrating the classroom, for instance, in deciding which student activities to react to or by aiding teachers to support students effectively. Recent work has provided initial evidence of teachers' enhanced awareness of student activities as a result of interacting with a dashboard. In this symposium, we focus on specific ways that teachers make use of dashboards and examine the relation between teacher characteristics and their dashboard use. The studies in the four contributions were conducted in different settings and domains, but all zoom in on one or more of the following teacher characteristics: age, gender, teaching experience, experience with technology, and epistemic beliefs. It is examined how these variables relate to patterns of dashboards use or to how teachers subsequently provide feedback to their students. Both lab studies and classroom observations were conducted to study this topic. Thus, each study focuses on how variations in implementation and use of dashboards are related to teacher characteristics. The implications of the work will be discussed from the perspective of teacher learning in terms of what abilities are required from teachers when using dashboard technologies in their instruction. Also, implications concerning the design of teacher dashboards.

The relation between dashboard function, teaching experience, and technological self-efficacy

Presenting Author:Anouschka van Leeuwen, Utrecht University, Netherlands; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

For collaboration between students to be successful, adequate teacher support is necessary. As a first step, teachers need to be able to identify groups that are in need of support. Teacher dashboards, that is, visual displays that provide teachers with information about their collaborating students, have been advocated for supporting teachers in enhancing their awareness of the activities collaborating groups engage in. As teachers differ in their amount of teaching experience and their technological skills, teachers may need different types of support from dashboards. As such, teacher dashboards may fulfill different roles, ranging from informing teachers to advising them. In this symposium contribution, we examine whether mirroring and advising dashboards can help teachers in determining which groups are in need of support, and whether teaching experience and technological self-efficacy play a role in this. We report on a controlled experiment in which teachers interacted with either mirroring ($n = 17$) or advising ($n = 18$) dashboards that showed information about fictitious collaborative situations. Teachers were asked to indicate which group they thought needed support. The results showed that only the dashboard's function influenced detection accuracy: in the advising condition, teachers more often correctly identified the group that was in need of support. As this was a small scale experiment, the results must be interpreted cautiously, but the initial findings are positive in the sense that no extensive experience or technological skill seems necessary to use the dashboards we presented to teachers.

Teacher dashboard use for orchestrating active learning in large lectures

Presenting Author:Jennifer Olsen, École Polytechnique Fédérale de Lausanne, Switzerland; **Co-Author:**Stian Håklev, CHILI, EPFL, Switzerland; **Co-Author:**Louis Faucon, CHILI, EPFL, Switzerland; **Co-Author:**Pierre Dillenbourg, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

In large lectures, dashboards can provide useful information to instructors that can support the implementation of active learning activities but it is largely unknown how instructors will use them. In this paper, we present a case study of two instructors orchestrating three different large lectures with 150-250 students. We found that, like previous research, the less experienced instructor spent more time lecturing, even during the individual activities. However, the dashboard use was similar between the instructors with more use occurring at the end of activities overall. Additionally, the progress dashboard was used closer to the end of the activities compared to other dashboards to inform when to switch activities. These results indicate the benefits of investigating when dashboards are being used during an activity to support the needs of the instructor at the right time.

How teacher characteristics relate to teacher dashboard use and feedback practices

Presenting Author:Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands

Previous research has indicated that teachers' use of dashboards in adaptive learning technologies (ALT) and related feedback practices are quite diverse. The number of dashboard consultations was found indicative of how teachers interpret dashboard data and translate it into feedback actions. This suggested a differential development of teachers' professional repertoire with regard to the integration of dashboards into their feedback practices. This study examines whether and how teacher characteristics, such as gender, age, years of teaching and experience with the ALTs are associated with teachers' differential dashboard use and feedback practices. We replicated findings that the number of dashboard consultations is related to teacher feedback initiations and the type of feedback given. However, none of the investigated teacher characteristics were related to dashboard use and feedback practices, except for experts judgement of teachers' ALT experience. Teachers judged as more experienced gave proportionally more dashboard-initiated feedback and provided more task feedback compared to teachers judged as beginners. Hence, teacher characteristics showed surprisingly little associations with dashboard use and teachers' feedback practices. Except for the experience judged by experts, teachers characteristics do not help us predict teachers use dashboard. The positive news is that professional routines around dashboards may not be dependent on particular teacher characteristics and that all teachers may develop these routines. The drawback is that professional development programs cannot simply be adapted based on teacher characteristics or teachers' own judgment of their practices.

Teachers' epistemic beliefs and orchestration through dashboards of groups working with CSCL tools

Presenting Author:Baruch Schwarz, Hebrew University of Jerusalem, Israel; **Co-Author:**Osama Swidan, Ben-Gurion University, Israel, Israel; **Co-Author:**Naomi Prusak, Hebrew University, Israel, Israel; **Co-Author:**Alik Palatnik, Shaanan Academic Religious Teachers' College, Israel, Israel; **Co-Author:**Adva Livny, Hebrew University, Israel, Israel

While dashboards for orchestrating collaborative work are implemented in various contexts, little is known about the differential use of dashboards by teachers. In the present study, we hypothesized that teachers whose epistemic beliefs represented a co-construction of knowledge perspective would use dashboards more effectively than teachers whose epistemic beliefs represented a transmission of knowledge perspective in their orchestration. We aimed at checking whether seniority impinged on the quality of orchestration. We asked 40 teachers to participate in an experiment in which we presented an environment, the SAGLET system, which is based on the Virtual Math Teams (VMT) environment (Stahl, 2009). SAGLET is a dashboard for learning geometry. It capitalizes on machine learning techniques to provide on-line alerts about "critical moments", that is, moments with a high potential of beneficial or detrimental effects for learning. The teachers could use SAGLET to observe six groups of students solving challenging problems in geometry. We used a questionnaire to check the teachers' epistemic knowledge, and to evaluate teachers' perception of the progression of the groups during problem solving: which group solved which task, whether proofs were valid, whether students' discourse was off-topic, etc. Twenty teachers received alerts and 20 teachers did not. We found that neither rich epistemic knowledge nor seniority helped in having a richer perception of groups' progression. Qualitative analyses of orchestration suggest that familiarity with information systems is a key skill for handling the orchestration of multiple groups working with CSCL tools.

Session B 5

12 August 2019 13:45 - 15:15

Lecture Hall - H10

Invited Session

EAPRIL Worldcafé on Practice-Based Research

Keywords: Design based research, Professions and applied sciences, Synergies between learning teaching and research, Teacher professional development

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Frank De Jong, Netherlands

Organiser: Martijn Willemsse, Windesheim University of Applied Sciences, Netherlands

Discussant: Frank De Jong, Netherlands

EAPRIL stands for *European Association for Practitioner Research on Improving Learning (in Education and Professional Practice)*. The organisation is deeply rooted in practitioner research. The trigger words *practitioner* and *research* tell the essentials about the common aims and passions of the people committed to EAPRIL, and of the presenters in this symposium.

But what exactly is *practitioner research*? And more importantly, what makes good practitioner research? Different expressions conceptualise this family of research, such as *practice-oriented research*, *practice-as-research*, *practice-based research*, *practice-led research* and *mixed-mode research* *practice and practice through research* (Candy 2006; Campbell 2007). Also design research (e.g. van den Akker, Gravemeijer, McKenney & Nieveen 2006), ecological transdisciplinary inspired research (ETI) (De Jong et al. 2013), and action research (Carr 2005; Campbell 2007) are often mentioned.

This kind of research yields a theoretical, and two practical kinds of knowledge. Although all three are relevant, the so called 'practitioner knowledge' (the *praxis* and the *techné*), need more attention in judging the 'goodness' of practitioner research. According to Heikkinen, De Jong and VanderLinden (2016) the 'goodness' of practitioner research has to be judged in its own terms. Following Kvale (1996) and Heikkinen, Kakkori & Huttunen 2001 they presented five principles of validation: *historical continuity*, *reflexivity*, *dialectics*, *workability* and *evocativeness*. These principles concretise the idea of validation that refers to an endless process of meaning making and negotiation, complementary the concept of validity in traditional research that leans on correspondence between propositions and the facts in the outside world.

In this symposium the nature and methods of practitioner research in practice are explored and discussed in-depth by means of 4 practitioner research projects. Questions that are put in dialogue: How is practice need build up in the study? How is it organised? How does this differ from academic research? Do we see the principles of validation or validity in work? Erko Sointu will go into the beneficial collaboration between the administration at institutional level and teachers for a strategic large-scale change of teaching and learning in the context of implementing flipping the class room. Practitioner research approach of selected pedagogical practices is beneficial. Harry Stokhof contribution discusses the importance of four quality indicators of practice-based research that can be integrated in four phase design-based research projects. The indicators are important for the end-users in determining the quality: to development of education, four indicators seem important for the contribution to the development of education: representative design, sustainability, reliability, and impact. Kati Mäkitalo takes the perspective of the practitioner researcher to discuss the advantages and disadvantages of attempts to strengthen the practitioner research by creating validation criteria. Main message is that practitioner research and its many faces and innovations should not be shackled by the standardised criteria. Hanna Tack goes into the importance of practitioner research as a professionalisation strategy for Flemish teacher educators.

Worldcafé 1

Presenting Author:Erko Sointu, University of Eastern Finland, Finland

Higher education still relies strongly on teacher-centered approaches in education. Technology is often used only as presenting information in the lectures or classes. In addition to learning the professional content, working life and society set additional demands for the students. These demands can be described from the 21st century skills perspective meaning that students should learn various skills such as collaborative skills, technology skills, thinking skills and continuous learning skills during their education. Teacher-centered approaches can be ineffective and cannot meet well enough the need of working life and society. Thus, change is required. The change of teaching and learning practices can be done at various levels from individual teachers to departments. However, a more strategic change at the institution level is one important possibility, align with practitioner research approach. For this purpose, a large-scale collaboration between teachers, researcher, developers and administration is needed. Additionally, other aspect such as shared goals for development, shared plans for the processes with tools, training, implementation of new practices, plans for the continuum and plans for the research are required. This symposium contribution describes one large-scale project for developing higher education teaching and learning practices. In this work, Flipped Classroom (FC) pedagogical approach, aiming for Flipped Learning culture, has a central role as teachers in various disciplines were trained to use it in their actual courses and research data were collected from these courses. Teachers were encouraged to use the data to study and report their work in close collaboration with researchers. Larger quantitative and qualitative data sets, which combines information from several courses, is used for research purposes and guiding decision making at the institution level. The developed FC model is now part of institutional pedagogical training and the results of entire work are encouraging.

Worldcafé 2

Presenting Author:Harry Stokhof, HAN University of Applied Sciences, Netherlands

Considering the objectives of practice-based research to contribute to development of education, four indicators seem important for the end-users in determining its quality: representative design, sustainability, reliability, and impact. Representative design refers to the degree educational research addresses real concerns of practitioners and develops solutions that are relevant for multiple teachers in various contexts (Pinder et al., 2011). One approach to enhance ecological validity is participatory design-based research, which involves teachers in the problem analysis, and design, development and testing of the solutions (McKenney & Reeves, 2018). A second indicator is sustainability, for practice-based research aims to develop lasting educational solutions that are adoptable and adaptable in multiple contexts (Loh et al., 2013). One strategy to develop sustainable educational solutions is multi-case prototyping approach (Nieveen, 2009). A third indicator for quality is reliability, especially because of the participatory design researchers should be alert for confirmation-bias and should be careful in extrapolating context specific results into general conclusions (Golafshani, 2003). The fourth indicator is impact on the field. Upscaling successful small-scale local innovations to multiple schools and educational contexts is notorious difficult (Pea & Collins, 2008). Real impact can be achieved when the effectiveness of an educational innovation remains robust when scaling up (Roschelle et al., 2008). Highly scripted solutions do not seem to be robust because of the risk of superficial interpretation and implementation. More open-ended curriculum materials appear to be a promising alternative for upscaling innovations (Zhang et al., 2011). In this contribution to the symposium the example of Stokhof et al. (2018) is used to show how the four indicators can be integrated in a series of four consecutive practice-based studies, consisting of a validation, development, effect, and implementation study. Results show that this type of research contributes to robust and sustainable educational solutions.

Worldcafé 3

Presenting Author:Kati Mäkitalo, University of Oulu, Finland

In the presentation I discuss advantages and disadvantages of bringing up the status of practitioner research by setting up the standardised criteria for judging the practitioner research in international academic research context. My fear is that we loose a lot of innovative practitioners (many faces) and then we miss "the place" where these great innovations can be shared by motivated practitioners. As a practitioner, I recognise that my practice under the certain circumstances is hard to replicate and standardise. My question is why I should care whether my practitioner research is standardisable, because of the decisions I make daily in my classroom cannot be standardised. I participate in different educational seminars and practitioner research conferences, because I am looking for new ideas to improve my own practice. More important for me is on how we interpret our current teaching practices in ways that make sense and how we develop a language for conveying the complexities of teaching to wider audience as well how we separate "the personal" from "the professional" in the context of research. Similarities can be found in Heikkinen, Kakkori and Huttunen's (2001) five principles of validation. But there are still more questions, for example I am not a good storyteller so how do I build a good narrative; how well historical continuity should be build based on the evidences and what kind of? what is the level of reflection I should accomplish? Further, how much I dare to take step to be more innovative ways of teaching when there is no long historical continuity behind it? Innovative ways of teaching might be useful for me, but is it useful for other practitioners. Do we loose "many faces" when trying to standardise practitioner research too much?

Worldcafé 4

Presenting Author:Hanne Tack, Ghent University, Belgium

This contribution discusses practitioner research and its importance as a professionalisation strategy for Flemish teacher educators. In particular, this contribution focuses on the conceptualisation, the design principles and the content of the one-year course 'Practitioner research' as part of the Flemish-wide and unique educational program for teacher educators (<https://ppw.kuleuven.be/opleiding-lerarenopleiders/>). In this course, teacher educators engage in practitioner research to improve their practice and to contribute to the wider knowledge base in teacher education. Apart from discussing some tensions we experience as facilitators of the course on practitioner research (e.g. the tension of telling and growth) in facilitating teacher educators in their practitioner

research, a critical discussion will be held on how we judge the "goodness" of the different practitioner research projects that are being conducted within this one-year course. In doing so, some important validation principles (*historical continuity, reflexivity, dialectics, workability and evocativeness*) are being discussed.

Session B 6

12 August 2019 13:45 - 15:15

Lecture Hall - H06 - Amazon Hörsaal

Invited Session

Motivational, Social and Affective Processes, Teaching and Teacher Education

Addressing Student Heterogeneity in Learning and Instruction in German-speaking Countries

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Case studies, Emotion and affect, Motivation, Pre-service teacher education, Quantitative methods, Quasi-experimental research, Self-regulation, Social interaction, Teacher professional development, Teaching/instruction, Video analysis
Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany

Chairperson: Alexander Groeschner, Germany

Discussant: Hilda Borko, Stanford University, United States

Discussant: Sanna Järvelä, University of Oulu, Finland

Teaching and learning in classrooms take place in a highly complex setting. Responsible teaching in classrooms therefore means to provide students with multi-faceted opportunities to learn. To respond to students' heterogeneity in class and to support student learning processes (cognitive and affective) in different domains, professional teacher competencies and adaptive methods of teaching and learning are required (e.g. with regard to classroom management, productive discourse). Not only teaching approaches, specific teacher competencies and a learning environment that addresses student heterogeneity are relevant, but also different approaches of assessment have to be taken into consideration (e.g. portfolio and rubrics). Traditional assessment has changed to a more process- and competence-oriented formative approach. The invited symposium will therefore focus on four empirical studies that address student heterogeneity in the context of learning and instruction in German-speaking countries. Each study aims to show effects of a specific topic on student cognitive and/or affective learning (e.g. reading and mathematics achievement, self-concept of abilities, achievement emotions). The studies, hereby, investigate the effects of various educational approaches (classroom management, formative assessment) and professional training on student learning. Thus, the studies contribute to the present state of the art and add new findings that will be discussed by two well-known international experts in the field of learning and instruction.

Academic self-concept and intrinsic motivation as predictors of mathematics and reading achievement

Presenting Author: Burkhard Gniewosz, University of Salzburg, Austria; **Co-Author:** Claudia Schreiner, University of Innsbruck, Austria; **Co-Author:** Alexander Steiger, Federal Institute for Education Research, Innovation, and Development of the Austrian School System, Austria; **Co-Author:** Maximilian Egger, University of Education Upper Austria, Linz, Austria; **Co-Author:** Andrea Kulmhofer-Bommer, Federal Institute for Education Research, Innovation, and Development of the Austrian School System, Austria; **Co-Author:** Christian Wiesner, Federal Institute for Education Research, Innovation, and Development of the Austrian School System, Austria

Aiming at a better understanding of individual predictors of achievement-related heterogeneity within classroom, this study investigated intrinsic motivation and the academic self-concept in the domains Mathematics and German. As part of the **Assessment of National Education Standards** and based on approximately 80.000 Austrian fourth and eighth graders, multi-level regression analyses showed stronger predictions of test scores by domain-specific self-concept than by intrinsic motivation. The associations between the self-concept and the test score did not differ across academic domains. However, there were hardly any predictions of intrinsic motivation in regards of reading achievement, as compared to mathematics. Finally, the effects sizes linked to the motivational predictors decreased across grade levels. The result patterns over time will be discussed in terms of changing frames of references across school transitions that took place after grade four and developmental changes. The overarching discussion focuses the relevance of these motivational predictors of achievement in term of dealing with heterogeneity in classrooms.

Self-regulation and -assessment in school – cognitive and affective effects of rubrics and portfolio

Presenting Author: Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:** Florian Hofmann, Friedrich-Alexander-University of Erlangen-Nuremberg, Germany; **Co-Author:** Susi Klaß, Friedrich Schiller University Jena, Germany

Self-regulated learning is a key competence for successful and individual learning processes (Zimmerman, 2002). For this reason, one of the central tasks of school education is to promote self-regulated learning. For the implementation of this overarching goal, various instructional concepts are developed and implemented. The potential of the portfolio approach for promoting self-regulated learning is strongly discussed (Strijbos et al., 2007). In addition, self-regulated learning in school may be promoted by the increased implementation of formatively used learning and competence surveys (Black & William, 1998). Particularly, formats with self-assessments (for example rubrics) may positively influence metacognitive processes, learning motivation, and enhance students' competencies. The presentation includes two quasi-experimental intervention studies aiming at an enhancement of self-regulated learning based on portfolio and rubrics. Both studies examined the postulated effects on students' cognitive and affective learning aspects and competencies in the context of regular school instruction – in German language and Physics instruction. The results indicate that both concepts are effective, as postulated. Beyond, differential effects regarding students' gender, performance and competence level were confirmed. In this presentation implication deriving from both concepts are discussed regarding the effects on self-regulated learning and the development of students' competencies in school instruction.

Dealing with disruptions in heterogeneous classrooms - a training on prevention and intervention

Presenting Author: Felicitas Thiel, Freie Universität Berlin, Germany; **Co-Author:** Victoria L. Barth, Freie Universität Berlin, Germany; **Co-Author:** Diemut Ophardt, Technische Universität Berlin, Germany; **Co-Author:** Irina-Rosa Kumschick, PH Luzern, Professions- und Unterrichtsforschung, Switzerland

A key objective of classroom management is to establish and maintain a social order that provides a framework for sustainable learning. Disruptions endanger learning. Dealing effectively with disruptions is therefore an important prerequisite for successful learning, especially in heterogeneous classrooms. A video-based training for student teachers was developed to foster competencies in professional vision of disruptions in the classroom and to develop effective strategies of intervention. For this purpose, staged-videos were produced based on a validated script. Three training studies with student teachers were carried out. A quasi-experimental design had been implemented. Changes in knowledge, professional vision and motivation were measured. Latent change models, single-factor variance analyses with repeated measurement, multivariate variance analyses and t-tests were calculated. The findings show that a targeted training in disruption prevention and intervention, which takes less than 6 hours, can increase knowledge of classroom management, competencies in professional vision and motivation. The training can effectively prepare student teachers for dealing with disruptions in heterogeneous classrooms.

How Productive Classroom Discourse Supports Teacher Judgment of Students' Self-concept of Ability

Presenting Author: Maralena Weil, Technical University of Munich, Germany; **Co-Author:** Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany; **Co-Author:** Ann-Kathrin Schindler, Technische Universität München, Germany

In general, a productive classroom discourse of teachers can help to appreciate students' contributions and provide effective feedback. But individual student characteristics also influence the classroom discourse and teachers' opportunities to interact with students and learn about their individual characteristics. In particular, student self-concept of ability has been shown a crucial characteristic that affects student verbal participation. To engage students more adequately, therefore, it is highly relevant for teachers to judge this characteristic accurately. The present case study describes how teacher learning opportunities during a professional development program regarding classroom discourse change teacher-student interactions, which in turn lead to a better teacher's judgement on students' self-concept of ability. It is shown that students with initially low self-concept benefit from productive discourse as teachers get more aware of them.

Session B 7

12 August 2019 13:45 - 15:15
Lecture Hall - H09
Single Paper
Teaching and Teacher Education

Teacher Professional Development

Keywords: Case studies, Competencies, Educational Psychology, Knowledge creation, Mathematics, Pre-service teacher education, Qualitative methods, Quantitative methods, Reflection, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Saku Määttä, University of Turku, Finland

The impact of student teachers' prerequisites on their acquisition of pedagogical knowledge

Keywords: Competencies, Pre-service teacher education, Quantitative methods, Teacher professional development

Presenting Author: Christina Dr. Watson, University of Paderborn, Germany

Longitudinal studies that deliver empirical evidence about the meaning of individual prerequisites and professional competences from future teachers still remain unresolved. Furthermore, there is a lack of profound data that analyses the development of pedagogical knowledge throughout the whole Bachelor- and Master studies in Teacher Education (cf. König, 2014). Gathering findings about the acquisition of professional knowledge and the impact of individual prerequisites is crucial to support and promote student teachers in their competence development to fulfill complex tasks successfully. This study analysed the longitudinal data of a 276 student teachers from the first semester of their bachelor degree to their third year of their master degree, assessed at five points. The first aim was to find out how professional pedagogical knowledge develops throughout Teacher Education at university. The second aim was to examine the impact of individual prerequisites (e.g. previous pedagogical experiences, career choice motivation) on the development of pedagogical knowledge. The results show a significant growth in pedagogical knowledge throughout their course of studies. The growth curve of the pedagogical knowledge is not linear but curve linear. Moreover, student teachers' prerequisites can explain individual differences in the development of pedagogical knowledge. Student teachers who have better final examination grades, more intrinsic motivation and previous experience in pedagogical settings show a higher acquisition of pedagogical knowledge.

Using relevance instructions to support the integration of teacher knowledge

Keywords: Knowledge creation, Mathematics, Pre-service teacher education, Teacher professional development

Presenting Author: Alexander Renkl, University of Freiburg, Germany; **Co-Author:** Helene Rieche, University of Freiburg, Germany; **Co-Author:** Eileen Spitzmesser, University of Freiburg, Germany; **Co-Author:** Alisa Röddiger, University of Freiburg, Germany; **Co-Author:** Timo Leuders, University of Education Freiburg, Germany

Preservice teachers face the challenge of integrating knowledge from different disciplines, such as general pedagogical-psychological knowledge (PPK) and pedagogical content knowledge (PCK). In two experimental studies, we investigated whether a prior instruction that highlighted the importance of knowledge integration (relevance instruction) supported the simultaneous application of different knowledge types. Preservice mathematics teachers worked on a computer-based learning environment, which contained two separate lectures. One lecture addressed PPK; the other addressed PCK. The preservice teachers received either a relevance instruction or a control instruction. In Study 1 ($N = 69$), the relevance instruction was presented only once to the preservice teachers, before the first lecture. The results showed that there was no effect of the instruction on the simultaneous application of PPK and PCK. In Study 2 ($N = 29$), the relevance instruction was presented twice, before the first lecture and before the second lecture. Additionally, we collected think-aloud data from all participants. The results showed that the repeated instruction encouraged the use of integrative strategies during learning and increased the simultaneous knowledge application. We conclude that relevance instructions can foster knowledge integration, but they need to be repeated to be effective.

Teachers' diagnosis of students' deep understanding

Keywords: Educational Psychology, Mathematics, Reflection, Teacher professional development

Presenting Author: Satomi Shiba, University of Tokyo, Japan; **Co-Author:** Yuri Uesaka, The University of Tokyo, Japan; **Co-Author:** Bethany Rittle-Johnson, Vanderbilt University, United States; **Co-Author:** Eriko Ota, University of Tokyo, Japan; **Co-Author:** Mari Fukuda, University of Tokyo, Japan

Teachers' ability to diagnose students' comprehension leads to constructing better daily lessons and students' deeper understanding. This study focuses on validating a new task for assessing teachers' diagnosis skills. We investigated how Japanese teachers rated students' deep understanding based on students' self-reflections. We selected 8 examples of students' self-reflections at the end of a lesson on division of decimals, selected to represent 4 levels of understanding (from shallow to deep conceptual understanding). Teachers were asked to rate the self-reflections for how well students understood the lesson and to justify their rating. A cluster analysis suggested 3 patterns of ratings, and we used teachers' justifications of their ratings to better understand the 3 clusters. Cluster1 ratings were highly matched to our theoretical ratings, and most of these teachers mentioned whether the self-reflections included the mathematical goal in their justifications. Cluster2 ratings were high for many self-reflections, including ones we considered to be shallow. Cluster3 ratings were poorly matched to our theoretical ones, and most of the teachers focused on how concrete the self-reflection was in their justifications. This suggested variation in teachers' belief for what is deep understanding and their skill at diagnosing it. This study was exploratory, but showed a new task to examine teachers' ability. Future study will investigate other factors that may influence their diagnoses, such as teachers' belief or instructional knowledge.

Learning from teacher perspective: Teachers' professional vision of students' mathematical learning

Keywords: Case studies, Mathematics, Qualitative methods, Teacher professional development

Presenting Author: Maikki Pouta, University of Turku, Finland; **Co-Author:** Erno Lehtinen, University of Turku, Finland; **Co-Author:** Tuire Palonen, University of Turku, Finland

Teachers' professional vision means making accurate notions, interpreting and deciding how to instruct students. The aim of this study was to research experienced elementary teachers' professional vision when they are teaching a demanding mathematical topic. Three experienced elementary teachers took part in the research. Math lesson was video recorded by using eye tracking glasses and regular video cameras. Stimulated think aloud task was conducted after recording. Results showed that teachers tend to notice, interpret and reason their instructional decisions related to aspects of classroom management instead of students' learning. When focusing on students, teachers tend to focus on low-achievers or high-achievers.

Session B 8

12 August 2019 13:45 - 15:15
Seminar Room - S04
Single Paper
Learning and Instructional Technology, Teaching and Teacher Education

Inquiry Learning

Keywords: Conversation/ Discourse analysis, Educational technology, Experimental studies, Inquiry learning, Learning Technologies, Qualitative methods, Science education, Secondary education, Self-regulation, Teaching approaches, Teaching/instruction

Interest group: SIG 20 - Inquiry Learning

Chairperson: Vasileios Symeonidis, University of Innsbruck, Austria

Learning from reviewing peers' concept maps in an inquiry context: to comment or to grade?

Keywords: Experimental studies, Inquiry learning, Learning Technologies, Secondary education

Presenting Author:Nataliia Dmoshinskaia, University of Twente, Netherlands; **Co-Author:**Hannie Gijlers, University of Twente, Netherlands; **Co-Author:**Ton de Jong, University of Twente, Netherlands

Giving feedback has been found beneficial for reviewers' learning as it actively involves them into a cognitive process of assessing someone else's learning product. However, the ways of giving feedback and their influence on learning are much less studied. This study aims at comparing giving feedback by writing comments and by grading to find out which way contributes more to the learning of a reviewer. Secondary school students from Russia (n=51) and the Netherlands (n=42) gave feedback on concept maps as a part of a physics lesson. The lesson was constructed in an online inquiry learning environment and lead students through the process of answering a research questions with the help of an online lab. Giving feedback was organized with a special Peer-Assessment tool, which also provided students with assessment criteria. Findings indicate that knowledge test scores were higher for students from the commenting group than from the grading group. The difference was the biggest for students with low prior knowledge. Possible educational implementations and directions for further research are discussed.

It's Not Only What You Say, But How You Say It: Prosodic and Content Analysis Of Teacher's Talk

Keywords: Conversation/ Discourse analysis, Inquiry learning, Teaching approaches, Teaching/instruction

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In this presentation, we introduce new insights into prosodic analyses as an emerging method to study what happens in classrooms interactions. We claim that the prosodic aspects (features of speech such as intonation, volume and pace) of talk are important, but under-represented in the learning sciences. These prosodic aspects may be used to complement, intensify or even reverse the linguistic content of speech. Thus far, most research on classrooms has focused on the content (what is said) rather than on understanding the meaning of the prosodic features (how it is said) of talk. Our study focuses on the prosodic perspective of teacher's talk to shed light on classrooms interactions. We present a case in which we align prosodic features with the content of teacher's talk during a nine-week physics course. This presentation shows that prosodic analyses may have added value for research on learning and professional development. Namely, we illustrate that acting in an authentic classroom setting might trigger specific prosodic aspects in teacher's talk. We further found indications that the teacher applied different voice prosody regarding certain patterns of classroom talk. For the future, we suggest that a combination of content and prosodic analysis is a promising tool for gaining new insights into classroom talk.

Detrimental effects of constructive learning activities on students' learning

Keywords: Educational technology, Inquiry learning, Learning Technologies, Science education

Presenting Author:Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Juliane Richter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Leonie Jacob, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Friederike Bilgenroth, Eberhard Karls Universität Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Through the advent of educational technologies, teachers increasingly gained access to virtual experiments that allow them realize cognitively engaging inquiry activities. To strengthen potential effects of virtual experimenting, it is generally suggested to add further consolidation activities, such as explaining in which students provide explanations about the underlying mechanisms of the experiment. Empirical evidence regarding these additive effects of inquiry-based activities and explaining, however, is scarce. In this study, we, therefore, investigated effects of adding virtual experiments and explaining activities to enhance students' learning. Students ($N = 118$) first received instructions about the central concepts of photosynthesis. Afterwards, they were either directly instructed by means of a video modeling example (DI), demonstrating how to conduct the virtual experiment or were actively engaged in conducting the virtual experiment (VE-only). A third group of students additionally explained the content of the virtual experiments in addition to conducting the virtual experiment (VE+E). Contrarily to our additive hypothesis, the DI condition outperformed both the VE-only and the VE+E condition regarding students' conceptual knowledge. Additional moderation analyses with students' domain-specific self-concept showed that the beneficial effect of video modeling examples was only significant for students with low levels of self-concept. Thus, our findings suggest that students' self-concept may be regarded as a boundary condition of technology-enhanced inquiry activities.

Views of middle school teachers and students on developing self-directed learning

Keywords: Inquiry learning, Qualitative methods, Self-regulation, Teaching approaches

Presenting Author:Penny Van Deur, Flinders University of South Australia, Australia

Middle school teachers are being urged to involve their students in inquiry learning to counter disengagement from learning common in this group. To do this, teachers need to develop students' self-directed learning skills so they will be equipped to take responsibility for their learning. This study reports perspectives of Australian middle school teachers and students about developing students' Self-Directed Learning (SDL). First, SDL is explained, then there is a discussion of the way teachers' views influence their classroom pedagogy and students' learning, and the way 'student voice' can assist educators and researchers to analyse and revise educational practices. Interviews showed that teachers and students expressed positive views about the value of SDL. Teachers commented that it can be difficult for teachers to relinquish control of student learning, and that some school practices could make it difficult for students to be able to assume responsibility for their learning. Students expressed the view that they wanted to manage their own learning and recognised that teachers could help them do this.

Session B 9

12 August 2019 13:45 - 15:15

Seminar Room - S12

Poster Presentation

Cognitive Science, Learning and Social Interaction, Learning and Special Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Early Childhood Education

Keywords: Assessment methods and tools, Attitudes and beliefs, Bilingual education, Cognitive development, Cognitive skills, Developmental processes, Early childhood education, Emotion and affect, Learning and developmental difficulties, Literacy, Mathematics, Parental involvement in learning, Primary education, Problem solving, Self-regulation, Teaching approaches

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 15 - Special Educational Needs

Chairperson: Iva Stuchlikova, University of South Bohemia Ceske Budejovice, Czech Republic

How do mothers support pre-schoolers in understanding emotions during picturebook reading?

Keywords: Early childhood education, Emotion and affect, Literacy, Parental involvement in learning

Presenting Author:Elisabeth Duursma, University of Wollongong, Australia; **Co-Author:**Cheryl Ho, University of Wollongong, Australia

Emotions play a vital role in children's normal functioning (Cicchetti, 1984; Kleinginna & Kleinginna, 1981), and understanding emotion is crucial for a healthy development. This study explored the different ways in which mothers can facilitate emotion understanding (EU) through shared bookreading. Twenty-seven mothers and their preschoolers (*Mean age*= 42.5 months) were videotaped while reading a storybook on emotions. Bookreading interactions were videotaped and coded focusing on explanation of emotions, checking if the child understood the emotion, and relating emotions through the plot and beyond the book. Results showed that: 1) bookreading provides an opportunity to deviate and discuss emotions beyond the book, 2) mothers related to past experiences to discuss the causes and consequences of emotions, and 3) children whose mothers discuss emotions beyond the book or relate to own experiences tend to respond more accurately to emotion-related questions during bookreading. This study showed that book reading can be a facilitative tool for mothers to

communicate and explicitly teach children about emotions in a number of ways such as based on the plot. These findings align with the literature, suggesting that mothers facilitate learning by scaffolding within children's Zone of Proximal Development (or the distance between what the child can do themselves and can do with the support of a skilled other) (Vygotsky, 1978) during bookreading (e.g., Bus & van Ijzendoorn, 1995). Implications of these findings, limitations and future directions will be discussed.

Problem solving through educational robotics in children with Developmental Coordination Disorder

Keywords: Cognitive development, Cognitive skills, Learning and developmental difficulties, Problem solving

Presenting Author:Margarida Romero, Laboratoire d'Innovation et Numérique pour l'Education, France; **Co-Author:**Anaïs Leroy, University of Nice-Sophia-Antipolis, France

About five percent of school-age children have a Developmental Coordination Disorder (DCD). This disorder leads to motor clumsiness and has repercussions on the child's entire life because DCD alters his autonomy and could increase social rejection and academic difficulties. One of the major learners' disappointments relates to the use of everyday tools at home, in leisure or at school. However, it is currently difficult to know whether these difficulties are related to either motor deficit disorders, visuo-constructive disorders (frequently associated with motor deficit disorder), or to a deficit linked to the development of the executive functions. In this study we will compare the results of children with DCD in conventional neuropsychological tasks evaluating executive function, visual-construction and manual dexterity with their performance in performing a problem-solving task on unfamiliar modular robotic cubes through the CreaCube task. This study aims to better understand the difficulties of using robotic tools among DCD children and to provide support for reflection on the care and schooling of children affected by this disorder.

A scale for measuring attitudes towards mathematics in preschoolers: ESAMAT

Keywords: Assessment methods and tools, Attitudes and beliefs, Early childhood education, Mathematics

Presenting Author:Carlos Mera, University of Cadiz, Spain; **Co-Author:**Manuel Aguilar-Villagran, University of Cadiz, Spain; **Co-Author:**Belén Román, University of Cadiz, Spain; **Co-Author:**Estibaliz Aragón, University of Cadiz, Spain; **Co-Author:**Jose I. Navarro-Guzman, University of Cadiz, Spain

Attitude towards mathematics (ATM) has been defined in a simple way as a positive or negative emotional disposition towards mathematics. Several studies show that attitudes towards mathematics correlate with performance. However, these studies on ATM have mostly been conducted in primary and secondary education while very few studies have been undertaken in preschool children. The aim of this research is to present a scale to measure ATM in kindergarten and first grade children. Results suggested that most children have positive attitudes at early ages, and these punctuations correlate positively with a math competence test (TEMA-3). Identifying early attitudinal problems can help educators to prevent school maladjustment in later stages.

A cross-cultural study on children's perception and play and learning: Results from Hong Kong

Keywords: Assessment methods and tools, Developmental processes, Early childhood education, Teaching approaches

Presenting Author:Doris Cheng, Tung Wah College, Hong Kong; **Co-Author:**James Ko, The Education University of Hong Kong, Hong Kong

This paper reports parts of the results of a cross-cultural study on children's perception and play and learning. Although emerging research suggested that children often do not distinguish play from learning, there is little empirical evidence on when and why they would do so. Failing to see we can learn from play not only means a loss of fun and more importantly, but also means the value of enacting play in learning in early years' institutions is neglected. As expected, findings indicated children. A set of specially designed picture cards was developed to elicit responses from children. Results from Hong Kong indicated developmental differences in children's views of play and learning. Older children tended to consider what they cannot do in the classroom as play. The results suggested play was hijacked in the Hong Kong early childhood education.

Bilingualism and verbal self-regulation: A study on underlying processes of the bilingual advantage

Keywords: Bilingual education, Primary education, Problem solving, Self-regulation

Presenting Author:Susanne Enke, University of Leipzig, Germany; **Co-Author:**Catherine Gunzenhauser, Leipzig University, Germany; **Co-Author:**Julia Karbach, University of Koblenz-Landau, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany

The present ongoing study aims at disentangling the underlying processes of the so-called "bilingual advantage" in the domain of executive functions and planning abilities (cf. Adesope, Lavin, Thompson, & Ungerleider, 2010; Barac, Bialystok, Castro, & Sanchez, 2014). It is assumed that bilingual children are better in applying verbal self-regulatory strategies during planning tasks than monolinguals leading to a better performance (Sawyer, 2016). We compared the performance of bilingual German-Russian speaking primary school students ($n_{BG} = 22$) and monolingual German speaking students ($n_{MG} = 28$) in a computerized version of the Tower of London task (Shallice, 1982). Participants administered three different experimental conditions, a regular condition, a tapping control condition and an articulatory suppression condition with an additional verbal task (Lidstone, Meins, & Fernyhough, 2010). Preliminary results show that bilingual children might be less impaired in the articulatory suppression condition, indicating a different role of verbal processes in the solution of complex planning problems for bilinguals and monolinguals.

Session B 10

12 August 2019 13:45 - 15:15

Seminar Room - S10

Poster Presentation

Instructional Design, Learning and Social Interaction, Teaching and Teacher Education

Argumentation, Reasoning and Inquiry Learning

Keywords: Argumentation, Biology, Collaborative Learning, Computer-supported collaborative learning, Experimental studies, History, Inquiry learning, Literacy, Out-of-school learning, Peer interaction, Reasoning, Science education, Secondary education, Social interaction, Teacher professional development

Interest group: SIG 20 - Inquiry Learning, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Sabine Manzel, Universität Duisburg-Essen, Germany

The effects of multimodal representations on students during cooperative, inquiry-based science

Keywords: Collaborative Learning, Inquiry learning, Science education, Social interaction

Presenting Author:Robyn Gillies, The University of Queensland, Australia

The study sought to determine the effects of teacher-introduced multimodal representations on students' task engagement and scientific language during cooperative, inquiry-based science. The study involved eight Year 6 teachers in two conditions (4 very effective teachers & 4 effective teachers) who taught two units of cooperative, inquiry-based science across two school terms. The results show that the very effective teachers spent significantly more time engaged in using embodied representations to illustrate points or communicate information. They also spent significantly more time engaged in interrogating students' understandings and scaffolding and challenging their thinking than the effective teachers. In turn, the students in the very effective teachers' classes spent significantly more time on-task and used significantly more relevant basic and scientific language to explain the phenomena they were investigating than their peers in the effective teachers' classes. These are behaviours and language that are associated with successful learning in science.

Development of Instructions for Disagreement Resolutions in Reasoning about Diverging Information

Keywords: Argumentation, Literacy, Reasoning, Science education

Presenting Author:Toshio Mochizuki, Senshu University, Japan; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Randi Zimmerman, Rutgers University Graduate School of Education, United States; **Co-Author:**Etsuji Yamaguchi, Kobe University, Japan

The aim of this study is to develop instruction that enables students to detect, analyze, and resolve disagreements among multiple conflicting texts. We developed a learning sequence to understand and to promote reasoned disagreement resolution about conflicting information, which includes (a) direct

explanation regarding steps to analyze and identify reasons for disagreements, and (b) peer discussion about contrastive examples to develop an understanding of the different reasons why disputants can disagree. Through identifying these disagreements, students are expected to integrate information better from multiple documents and resolve key disagreements among texts. Sixty-two Japanese students were trained under one of these two conditions (the above-mentioned instruction or the instruction to create a table comprising each text's summary) in three weekly sessions; and then in a fourth session wrote a comprehensive essay regarding a set of conflicting texts about dieting methods. The result showed that the students who received disagreement reasoning (DR) instruction outperformed in disagreement identification, as well as in disagreement resolution which focused on the disagreements about the ideals used among the texts. This indicates the effectiveness of the proposed instruction to identify disagreements and to promote integration from diverging information. This paper discusses the potential of DR instruction which encourages students to reason more deeply about disagreements among conflicting information in multiple documents. We also discuss future needed directions to investigate the process to promote better reasoning about disagreements in multiple documents.

Quality of Collaborative Group Engagement in Face-to-Face High-School Physics Argumentation

Keywords: Argumentation, Collaborative Learning, Science education, Social interaction

Presenting Author: Dalila Dragnic-Cindric, University of North Carolina at Chapel Hill, United States; **Co-Author:** Nikki Lobczowski, University of North Carolina at Chapel Hill, United States; **Co-Author:** Sara Baszczewski, The Pennsylvania State University, United States; **Co-Author:** Jeff Greene, University of North Carolina, United States; **Co-Author:** Ana Butler, The Pennsylvania State University, United States; **Co-Author:** P. Karen Murphy, The Pennsylvania State University, United States

Effective student engagement is a cornerstone of learning. With an aim of contributing to the understanding of domain-specific aspects of engagement in science, we investigated the quality of collaborative group engagement in face-to-face high-school physics argumentation. We conceptualized engagement as contextual and multidimensional, focusing on behavioral, social, cognitive, and conceptual-to-consequential dimensions of engagement. We studied the quality of engagement in three experimental and three comparison groups at two discussion points, at the beginning and end of the school year. Using discourse analysis as well as qualitative analysis, we investigated patterns and changes in the quality of groups' engagement for each of the dimensions. Findings and implications for the design of learning contexts that effectively engage students in scientific argumentation are discussed.

Analyzing students' causal historical reasoning. Effects of a professional development program.

Keywords: History, Reasoning, Secondary education, Teacher professional development

Presenting Author: Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:** Gerhard Stoel, RICDE / University of Amsterdam, Netherlands

This contribution reports on a study that investigated the effects of a professional development program aiming at improving history teachers' abilities in teaching causal historical reasoning. Central aspect in this the PD-program was the analysis of students' reasoning as a way to gain insight in students' causal reasoning. The assumption was that gaining more insight in students' ways of reasoning, the problems they face, and in the way this reasoning develops, might help teachers in teaching causal reasoning. Eleven teachers participated in this program. Interviews and questionnaires were used to gain insight in the effects of the program on teachers' self-efficacy and practice on teaching causal reasoning. In addition, students filled out a learner report, which provided insight in their learning experiences. Results indicated that teachers felt more equipped to teach causal reasoning. They gained more insight in what causal reasoning entails and the problems students encounter. This enabled them to design lessons that were more tailored to students' actual level of reasoning. Students appreciated these lessons and indicated that they learned about causal reasoning, especially about reasoning with multiple causes and making causal connections. Although this is a small scale study, it is concluded that analyzing student reasoning as part of PD is an effective approach, which might also be fruitful to expand to other types of reasoning and domains.

Linking out-of-school and in-classroom instruction using a Citizen Science Approach to Learning

Keywords: Biology, Out-of-school learning, Reasoning, Secondary education

Presenting Author: Alena Røgele, University of Tuebingen, Germany; **Co-Author:** Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Christoph Randler, University of Tuebingen, Germany

Scientific thinking is a central competence that students should acquire during school. The goal of this project is to implement a new concept in school teaching which, through a combination of out-of-school learning methods, the use of mobile devices and traditional school lessons, aims at improving scientific reasoning skills, learning and students' motivation in Biology. A Citizen Science (CS) approach is pursued to realise this project. Asking students to work like professional scientists in the context of the citizen science project is expected to enhance their scientific reasoning skills. The project is concerned with biodiversity regarding waterfowl. Students in the experimental group observe waterfowl during a field trip, identify them and submit their data by using a tablet to an international CS bird biodiversity database, whereas the control group receives an in-classroom lesson regarding the same topic. To ensure a link between the school lessons and the field trip, the collected data are used to design the lesson and to work with afterwards. The geographic selection of the data with which the students work in the classroom is varied between experimental and control groups: Whereas the experimental group works with the data they collected during their field trip, the control group relies on nationwide data from the international CS database. Unexpectedly, preliminary results (four classes) show no differences between groups so far and hence no benefits of partaking in field trips. Final results are expected in spring 2019.

The effect of using smart devices for communication to support inquiry-based learning

Keywords: Computer-supported collaborative learning, Experimental studies, Inquiry learning, Peer interaction

Presenting Author: Külli Kori, Tallinn University, Estonia; **Co-Author:** Eliis Vana, University of Tartu, Estonia

Inquiry-based learning is a widely used method in science classes. However, communication and collaboration with peers could support inquiry-based learning and help students to learn more. Smart devices could help here as they enable fast communication with peers, are available for almost all the students in school and computer-mediated collaboration has found to have positive effect on learning. Therefore, the current study investigates the effect of using smart devices to support communication in inquiry-based learning and compares it with face-to-face communication and solving the task independently. Experimental research design was used and Estonian 9th grade students were divided into three groups: 1) communication in experiment planning phase of inquiry task is supported by smart devices, 2) communication in experiment planning phase of inquiry task takes place face-to-face, 3) no communication during inquiry task. The results of the study will show how communication with smart devices and face-to-face communication in experiment planning phase of inquiry task influences students' experiment planning skills and the knowledge of the science subject. The results give ideas to teacher as which type of communication should be used in school for better learning results.

Session B 11

12 August 2019 13:45 - 15:15

Seminar Room - S11

Poster Presentation

Learning and Social Interaction, Motivational, Social and Affective Processes

Educational Psychology

Keywords: Assessment methods and tools, Collaborative Learning, Educational Psychology, Emotion and affect, Metacognition, Motivation and emotion, Primary education, Professions and applied sciences, Psychometrics, Self-efficacy, Self-regulation, Social development, Survey Research, Video analysis

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 25 - Educational Theory

Chairperson: Tobias Fredlund, University of Oslo, Norway

Situation specificity of educational practitioners' subjective theories

Keywords: Assessment methods and tools, Educational Psychology, Metacognition, Professions and applied sciences

Presenting Author:Jean-Luc Patry, University of Salzburg, Austria

Practitioners claim to act situation specifically, and they do so. This is only possible if their action-guiding subjective theories are situation specific as well. On the other hand, practitioners should act similarly in the same situation, but due to their different backgrounds one can doubt that they actually do so. Hence, in this study the subjective theories of practitioners with respect to different situations are assessed. The hypotheses are (1) that the same practitioner has different subjective theories with respect to two (or more) different situations, and (2) different practitioners have different subjective theories with respect to one situation with which both of them are confronted. The subjective theories are assessed using the structure-laying technique based on dialogue and consent. The subjects were from different fields; among others, mothers and fathers of the same children were compared, social workers dealing with the same clients, teachers with the same students, etc. The laid structures are transformed into transition matrices which then can be compared. Because of the heterogeneity of the conditions, the hypotheses are tested separately for each of the comparisons, and the aggregation is done on the level of the hypotheses. The results show that with few exceptions, the two hypotheses are confirmed. The discussion deals with the question of situation specificity and with the available theories and their transfer into action.

Do dimensional upward comparisons serve self-enhancement needs?

Keywords: Educational Psychology, Emotion and affect, Motivation and affect, Self-regulation

Presenting Author:Tobias Baumann, University of Wuppertal, Germany

Dimensional Comparison Theory (DCT) assumes that students compare their academic achievement intraindividually across domains to form domain-specific self-concepts. While upward dimensional comparisons have been shown to result in lower self-concepts in the worse-off domain, downward dimensional comparisons lead to higher self-concepts in the better-off domain. DCT further describes several possible motive underpinning dimensional comparisons, among them self-enhancement, which describes the drive to view the self in a positive light and to protect global self-esteem from threat. If dimensional comparisons indeed serve the self-enhancement motive, then people who have been subjected to a threat to global self-esteem should prefer upward comparisons to downward or lateral comparisons. To test this assumption, 93 university students completed an online questionnaire consisting of 6 scenarios, 3 of them describing a positive achievement feedback (no-threat condition) and 3 of them describing negative achievement feedback (threat condition). They then indicated the likelihood that they would undertake upward, lateral or downward dimensional comparisons in response to threat vs. no threat to self-esteem. The results clearly substantiate the importance of the self-enhancement motive, with upward comparisons being rated as the most likely in the self-esteem threat condition, while in the no-threat condition, upward and lateral comparisons were judged as equally likely, with downward comparisons being the least prevalent. Dimensional comparisons are more than "cold cognition" and might serve as an important mechanism for coping with academic failure.

Building a New Model for the Formation and Regulation of Emotions in Collaborative Learning

Keywords: Collaborative Learning, Educational Psychology, Emotion and affect, Self-regulation

Presenting Author:Nikki Lobczowski, University of North Carolina at Chapel Hill, United States

Previous models of emotions in academic settings focus on either emotion formation or regulation, but rarely both. Furthermore, these models concentrate on the emotions of individual students, rather than a group of students. In this theoretical paper, I introduce a new model for socioemotional learning and regulation. This model is derived from existing literature in various fields, including social and educational psychology. It explores four stages of emotion formation, including the context/situation, stimulus event, appraisal, and emotional response, followed by a fifth stage for regulation. By highlighting both emotion formation and regulation, this model considers emotions from a holistic view, thus allowing a better conceptualization of emotions in group learning. The socioemotional model also expands on traditional models for academic emotions by integrating an interpersonal level (i.e., I, you, we) and includes important considerations for working with others at each stage in the model. This model has implications for future research and practice, as it can be used to inform the design of learning environments and can help instructors teach groups of students how to regulate their emotions.

FaceReader as a means to detect primary school students' emotions during science workshops

Keywords: Educational Psychology, Emotion and affect, Primary education, Video analysis

Presenting Author:Elisa Vilhunen, University of Helsinki, Finland; **Co-Author:**Kalle Juuti, University of Helsinki, Finland; **Co-Author:**Anni Loukomies, University of Helsinki, Finland; **Co-Author:**Jari Lavonen, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Detecting and evaluating students' emotions in learning situations is essential for developing new pedagogical practices. In this study, the data obtained with a facial expression recognition program, the FaceReader, is examined. The data is gathered in the context of a social-psychological intervention that aims to promote positive emotions, in Finnish primary school science workshops. The data consists of 398 video clips recorded with 39 students (7–10 years). From the pre-recorded videos, FaceReader recognized six facial expressions: neutral, happy, sad, surprised, angry and scared, plus "other". For each individual video FaceReader gave an expression summary presenting the overall responses during the analysis as percentages. Using these individual expression summaries, the mean distributions of emotions were calculated. In the videos, neutral was the most typical emotion (44.65 %), followed by happy (23.37 %) and surprised (13.57 %). All the other emotions (sad, angry, scared and other) were present only in minor proportions. Our preliminary results, together with previous findings, show that FaceReader is a promising tool for measuring emotions in educational settings, even with younger students.

The translation and validation of the interest/deprivation young children scale to Swedish

Keywords: Educational Psychology, Motivation and emotion, Psychometrics, Survey Research

Presenting Author:John Kaneko, Stockholm University, Sweden

Children's curiosity about knowledge and facts (epistemic curiosity) is implicated as an important factor in learning. The Swedish preschool curriculum, among several others, points out curiosity as foundational for learning activities. To acquire data concerning the impact of curiosity on different pedagogical interventions in a Swedish RCT study, translation and validation of the interest/deprivation young children scale (I/D-YC) developed by Piotrowski et al. (2014) was conducted. The I/D-YC scale consists of 10 items with a 5 point likert scale, which were rated by parents in order to evaluate two types of trait curiosity in their children. Psychometric data indicated that the scale had a non-convincing fit to the proposed two factor model. Furthermore the hypothesized associations with measures from SDQ did not show the pattern of the original scale but did show other features that might be consistent with the interest/deprivation model of curiosity. Implications of future translations and validations are discussed.

The Longitudinal Interplay Among Early Family Risks, Self-Efficacy and Socio-Emotional Development

Keywords: Educational Psychology, Self-efficacy, Self-regulation, Social development

Presenting Author:Fabio Sticca, Marie Meierhofer Children's Institute, Switzerland; **Co-Author:**Olivia Gasser-Haas, Marie Meierhofer Institute for the Child, Switzerland; **Co-Author:**Corina Wustmann Seiler, Pädagogische Hochschule Zürich, Switzerland

Self-efficacy proved to protect against the detrimental effects of various risks, including familial risks. The present study aimed to address this research gap by examining the promotive and the protective model from both a short-term and a long-term perspective. A total of 294 (T1), 239 (T2), and 189 (T3) children from 24 childcare centers were assessed from early to middle childhood. Familial risks were assessed at T1 (mean age = 2.81 years), while self-efficacy and socio-emotional outcomes were assessed at T2 (mean age = 3.76 years) and T3 (mean age = 9.69 years). Results from structural equation models with latent orthogonalized interactions yielded support for the promotive role of self-efficacy in the short term, while no consistent support for neither the promotive role nor the protective role of self-efficacy was found in the long term. Taken together, our results point to the importance of self-efficacy for socio-emotional outcomes independently of risks, which indicates that promoting self-efficacy might counter the negative short-term effects of familial risks but can not buffer them.

Session B 12

12 August 2019 13:45 - 15:15

Seminar Room - S14

Poster Presentation

Assessment and Evaluation, Culture, Morality, Religion and Education, Educational Policy and Systems, Learning and Social Interaction, Motivational, Social and Affective Processes

Educational Effectiveness, Accountability and School Improvement

Keywords: Achievement, Assessment methods and tools, At-risk students, Citizenship education, Cultural diversity in school, E-learning/ Online learning, Educational policy, Educational Psychology, Higher education, Knowledge creation, Learning and developmental difficulties, Learning approaches, Motivation, Primary education, Qualitative methods, Quantitative methods, School effectiveness, Secondary education, Survey Research

Interest group: SIG 18 - Educational Effectiveness, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Christopher Osterhaus, Ludwig-Maximilians-Universität, Germany

The contribution of school characteristics to secondary school students' citizenship skills

Keywords: Citizenship education, Quantitative methods, School effectiveness, Secondary education

Presenting Author:Elaine Godaert, Ghent University, Belgium; **Co-Author:**Lisa De Schaepmeester, Ghent University, Belgium; **Co-Author:**Johan van Braak, Ghent University, Belgium; **Co-Author:**Koen Aesaert, Ghent University, Belgium

Although several studies emphasize the role that schools play in fostering students' citizenship skills, little empirical evidence is available indicating which school characteristics are related to students' citizenship skills. As such, the central aim of this study is to investigate which school level characteristics are related to secondary school students' citizenship skills. To gather information on the student and school characteristics, questionnaires were administered to 1142 secondary school students and their school leaders (n= 49). The results of the multilevel analysis show that the differences in students' citizenship skills are attributed to student level characteristics such as gender, spoken language with the mother, grade retention, educational stream, and the number of books at home. With regard to the school level characteristics, proportion of low SES students, participation in decision-making and the curriculum (organizational implementation in the curriculum and didactic methods) are significantly related to students' citizenship skills.

MOOC Effectiveness as a Reflection of MOOC Learner's Goals Set and Achieved

Keywords: E-learning/ Online learning, Motivation, Qualitative methods, Quantitative methods

Presenting Author:Polina Pekker, Lomonosov Moscow State University, Russian Federation

An increase in popularity of online learning encourages educators consider different ways of sustainable development of MOOCs to make them appeal to potential learners. To be able to adjust courses to changing demands, instructors have to agree on what MOOC effectiveness is. A common approach is to define it by simply checking the number of learners who earn a MOOC certificate. However, most of subscribers initially don't aim at getting a certificate. This leads to the idea that online learning can't be measured with traditional metrics. Current article considers some possible options of measuring MOOC effectiveness. The conclusions driven are based on 23 interviews with MOOC instructors from UC Berkeley University, who were asked to give their opinions on key indicators of measuring MOOC effectiveness. Moreover, a profile of MOOC students was completed by collecting socio-demographic data and personal intentions (N=137 081, across 14 courses). Collected metrics is analyzed to work out a correlation between learners intentions and measuring MOOC effectiveness.

Applicability of an academic resilience model

Keywords: At-risk students, Learning and developmental difficulties, Primary education, Quantitative methods

Presenting Author:Dóra Fanni Szabó, MTA-SZTE Research Group on the Development of Competencies, Hungary

Research on academic resilience has increased considerably over the last decade. Former empirical analyses have explored a wide range of factors, which contribute to success, despite the presence of disadvantaged socio-economic background. Our investigation focuses on the development of a resilience model. We assume that the involved factors are related to school performance. The objective of the presentation is (1) to present the structure of the hypothetical model and psychometric characteristics of this (2) to analyse the connection between the involved factors and the outcome variables, as well as (3) to examine the differences between resilient and non-resilient students. We analysed data from 1542 fourth and sixth grade students. Online data collections were carried out by the Electronic Diagnostic Assessment (eDia) platform. The applied scales measured 15 different factors and worked with acceptable reliability (Cronbach- α -.74 or over). The results revealed that in the case of resilient students a couple of factors (e.g. school attachment) do not predict performance significantly. Other findings suggested that there are more involved factors which are strongly related to performance (e.g. perseverance). Based on multi-group analysis, we tested measurement invariance of the modified models among resilient and non-resilient subgroups. The models with all parameters freely estimated fit the data well (CFI=.903-.912, SRMR=.060-.064), although the overall chi-squares were significant. Therefore, we conclude that the latent structure is similar across the groups. The results of the study contribute to a more thorough understanding of the role of individual, interpersonal and school-related factors among at-risk students.

Relationship between choices in general upper secondary school and admission to educational sciences

Keywords: Educational policy, Educational Psychology, Higher education, Secondary education

Presenting Author:Jenni Kunnari, University of Oulu, Finland; **Co-Author:**Jouni Pursiainen, University of Oulu, Finland; **Co-Author:**Esa Laara, University of Oulu, Finland; **Co-Author:**Jarmo Rusanen, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

The study examines the students accepted to educational sciences in Finnish universities during 2013-2015 and their results in matriculation examination, ME (N = 5116). The data is from university registers and the instance which implements the ME, The Matriculation Examination Board. There were three identifiable ways of scoring the results of ME, in this research classified into groups A, B and C, based on the student selection criteria applied in educational sciences during 2013-2015. Degree programs that belonged to the group A gave points to defined subjects, group B to the best subjects and group C did not give points based on the results in ME. The classification of scoring the results in the ME was used as a background variable. In the ME, the students had most often accomplished basic mathematics (49 %), health education (46 %) and psychology (46 %). The students had participated most commonly in five (42 %) or six (37 %) tests. Students who took part in advanced mathematics (28 %) participated in a higher number of tests. Students succeeded in the ME with, on average, lower mean test scores when compared to all accepted students in 2013-2015. Accepted students by classification groups A and B did usually succeed better in the ME. Otherwise, the educational sciences got students with similar student profiles, regardless of the way of scoring the results of ME. However, there was considerable variation among the students.

Differential perception of the usefulness of standardized student assessments

Keywords: Achievement, Assessment methods and tools, Primary education, Survey Research

Presenting Author:Kathrin Vettorazzi, ISQ - Berlin Brandenburg Institute for School Quality Improvement, Germany; **Co-Author:**Marina Wenger, ISQ - Berlin Brandenburg Institute for School Quality Improvement, Germany; **Co-Author:**Anna Lena Schilling, Freie Universität Berlin, Germany; **Co-Author:**Holger Gaertner, Freie Universität Berlin, Germany

The implementation of standardized student assessments is expected to be of great benefit for the implementation of national education standards and competence-oriented teaching. In a low-stakes system like the one in Germany, the usefulness of test results for instruction development is determined in particular by the perceived usefulness and readability of the feedback. This study examines the influence of personal characteristics of teachers and school principals as well as characteristics of the feedback (readability) on the perceived usefulness of the tests. To this end, elementary school teachers and school principals in two German states (one rural, one urban) were surveyed using an online questionnaire (N = 415). The perceived usefulness of standardized student assessment is partly related to personal characteristics. For example, teachers in rural areas rate the usefulness of the tests higher than in the city (d = .58) and school principals higher than teachers (d = .58). Nevertheless, the measured personal characteristics can explain only 6% of the variance in perceived usefulness. However, the readability of the information from the feedback is strongly related to the perceived usefulness of the standardized student assessment for instruction development (.32 < r < .52; p < .001) and together they explain up to 33% of the variance in perceived usefulness. This result provides some indications to optimize the feedback, in particular by adapting it for specific groups (teachers, principals).

Significant learning experiences of Estonian students at a 'happy school'

Keywords: Cultural diversity in school, Knowledge creation, Learning approaches, School effectiveness

Presenting Author:Eda Heinla, Tallinn University, Estonia; **Co-Author:**Tiiu Kuurme, Tallinn University, Sweden

By Fink (2003) significant learning experiences comprise six dimensions: Foundational Knowledge, Application, Integration, Human Dimension, Caring, Learning to Learn. The purpose of study: determining what kind of learning experiences are considered significant by the students studying at a school with the reputation of a 'happy school'. Research method. Interviews with student focus groups, an open-ended questionnaire. Questions: describe the significant things you have learnt at school, outside school, what you would like to learn for their future life. Participants: 13-15 years old students, n=140, 53% boys. Findings. Of the things learnt at school, students place greatest importance on knowledge in various subjects. Only a few odd students holding that school is a place where one can learn problem solving, creative thinking. Of the things learnt outside school, students place the greatest importance on learning various skills. The second important thing mentioned is acquiring social skills at school and outside school. About their personality students can find out more outside school. The most important thing students wish to learn in the light of their future life is general and subject-specific knowledge. Another important thing is to learn how to cope in life. We conclude that for students, a significant learning experience is related to learning various skills and how to cope in life, but less value is placed on learning to know oneself.

Session B 13

12 August 2019 13:45 - 15:15

Seminar Room - S16

Poster Presentation

Teaching and Teacher Education

Pre-Service Teacher Education

Keywords: Attitudes and beliefs, Cognitive skills, Competencies, Computer-assisted learning, Distributed cognition, Educational policy, Emotion and affect, Game-based learning, Higher education, Mathematics, Pre-service teacher education, Qualitative methods, Quantitative methods, Social interaction, Teaching/instruction, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Martin Rehm, Pädagogische Hochschule Weingarten, Germany

What prevents Social Innovation in Kindergarten?

Keywords: Attitudes and beliefs, Educational policy, Emotion and affect, Pre-service teacher education

Presenting Author:Jasmin Luthardt, University of Applied Science Potsdam, Germany

The focus of my project on the processes of social innovation in ECEC, especially innovative formats of adult-child interaction in Kindergarten, by using a variation of the SKAD as guiding research program, based on cognitive sciences, in particular Thagards Theory of Emotional Coherence. The central method Cognitive-Affective Mapping is a qualitative tool to identify, visually represent and analyze beliefs. It enables to compare the structure, the content and the connected emotions in discourses concerning interaction on macro-, meso- and microlevel:(1) Macrolevel - educational policy and training providers as guiding instructors(2) Mesolevel – Kindergarten as organization(3) Microlevel - Pre-school teachers as individualsCAMs on each level display not only the conceptual structure of the involved actors' views, but also their emotional nature, that influences decisions, actions and in the end the implementation of social innovation.First results of the CAM-comparison will be reported, focusing on neuralgic points and contrasting views and emotions. There is reason to believe that those inconsistencies inhibit processes of social innovation. The results indicate, f. e., that the instructors on the macro level send diffuse messages to the pre-school teachers; that opens up scope for interpretation, which only conditionally changes the practice in kindergartens; to what extent this is problematic or not will be discussed, particularly in the context of the quality of the processes in kindergarten and their changeability from present to future.

Authenticity in a role-play simulation of diagnostic interviews for pre-service mathematics teachers

Keywords: Competencies, Mathematics, Pre-service teacher education, Quantitative methods

Presenting Author:Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Bernhard Marczynski, University of Munich (LMU), Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany; **Co-Author:**matthias siebeck, Ludwig Maximilians University, Germany

Teachers' diagnostic competences form an important prerequisite for adaptive teaching and student learning. Realistic and authentic tasks that allow participants to feel as if present in the situation are put forward as important learning opportunities as well as assessment situations for professional competences, such as teachers' diagnostic competences. Based on research from teacher education and experiences from medical training, role-play-based simulations of one-to-one interviews might be a valid and efficient context to foster and assess pre-service teacher students' diagnostic competences. However, while such simulations may be easily adapted and implemented in pre-service teacher training, it is not yet known to which extent the participants perceive them as authentic learning and assessment tasks. Moreover, information on factors determining these perceptions have rarely been explored.In this poster presentation, we will report on role-play-based simulations of diagnostic interviews in decimal fraction arithmetic. These simulations were developed as part of a larger project focusing on fostering diagnostic competences of pre-service teachers. We will study the perceived authenticity of these simulations, contrasting pre-service and in-service teachers. Moreover, we will explore which individual characteristics, including interest, self-efficacy, and professional knowledge, influence students' perceptions of the simulation. We will draw conclusions about the development of role-play-based simulations for pre-service teacher training, and about how to adapt such learning opportunities based on students' learning prerequisites.

Simulations to help pre-service teachers in diagnosing scientific reasoning in physics and biology

Keywords: Cognitive skills, Computer-assisted learning, Higher education, Pre-service teacher education

Presenting Author:Amadeus J. Pickal, University of Hildesheim, Germany; **Co-Author:**Christof Wecker, Universität Hildesheim, Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:**Raimund Girwidz, LMU Munich, Germany

Since it is important for teachers to be able to impart and diagnose not only subject-specific but also interdisciplinary competences, we developed simulations to quantify and furthermore support the ability to diagnose scientific reasoning skills of secondary school students. The simulations are video-based containing short, scripted videos showing two students working on a biology / physics experiment. Participants have to observe the students and can individually decide which pre-formulated questions they want to ask the students before, during and after the experiments to gather relevant information. This information is later used to write down a diagnosis. We use these simulations to study the performances of pre-service teachers and how they are influenced by prior knowledge and interdisciplinary teacher cooperation.

Preservice teachers' experience in an innovative training activity: Serious games as protected space

Keywords: Attitudes and beliefs, Game-based learning, Pre-service teacher education, Teaching/instruction

Presenting Author:Christian Sebastián, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**María Josefa Smart Torrealba, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Sebastián ZAPAPA, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Martín Vergara Wilson, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Macarena Sanhueza Céspedes, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**María Rosa LISSI, Pontificia Universidad Católica de Chile, Chile

Epistemological beliefs are the "understandings, premises or propositions about the world that are felt to be true" (Richardson, 1996 p.103 in Dunekacke et al, 2016, p.126) that all human beings have about knowledge and learning. Teachers who operate with more developed epistemological beliefs tend to promote

better learning in their students. Therefore, it is a highly relevant objective that future teachers, during their undergraduate training, get to develop their beliefs. Several studies suggest that this objective is a remaining challenge. In an attempt to fulfill this task, we developed a 10 sessions workshop with 13 preservice teachers, in which we designed and implemented activities that make the development of epistemological beliefs more likely, considering the promotion of *cognitive conflict* and the characteristics of *protected spaces* (Bourgeois & Nizet, 1997) and *serious games* (Gee, 2008). After the implementation, participants were interviewed according to the methodology of *practice stories* (Rouleau, 2015), with the aim of investigating the experience of participation of future teachers in non-traditional learning and teaching activities, from a subjective and retrospective point of view. Preliminary results indicate that the most outstanding aspects in participants' narratives are related to the characteristics of the *protected space* and *serious games*, giving initial clues of how future teachers commit to this type of learning-teaching activities. Final results and analysis' - through a *qualitative content analysis* (Mayring, 2014) of the interviews- will be presented in the final article.

Comparing strategies to develop teachers' epistemological beliefs in the interpsychological plane

Keywords: Attitudes and beliefs, Distributed cognition, Pre-service teacher education, Social interaction

Presenting Author: Martín Vergara Wilson, Pontificia Universidad Católica de Chile, Chile; **Presenting Author:** Macarena Sanhueza Céspedes, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Christian Sebastián, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Josefa Smart Torrealba, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Rosa Lissi, Pontificia Universidad Católica de Chile, Chile

Teachers who operate with more developed epistemological beliefs tend to promote better learning in their students. Therefore, it is a highly relevant aim that future teachers, during their undergraduate training, get to develop their beliefs. Several studies suggest that this objective would not be achieved. Adult learning theory suggest that to promote beliefs development, people must participate in situations in which previous beliefs experience a cognitive conflict (Bourgeois & Nizet, 1997/2007). Even more, it is necessary that the resolution of this conflict occurs in an interactional way, through the production of more developed epistemological beliefs in the situation of interaction itself. Additionally, considering the threat to identity that results from conflicting epistemological beliefs of pre-service teachers (Mornata, 2011), we hypothesize that for student to be engage in this type of situation it is required that they participate in learning activities that offers sufficient psychological security to risk changing. The teaching-learning strategies that are structured as games could offer this type of characteristics. We present a microgenetic study in which this hypothesis is evaluated. Eleven small groups of undergraduate education students were randomly assigned to one of two conditions: a) game v/s non-game strategies. The study aims to determine in which strategies the displayed argumentative sequences inform the more developed epistemic thoughts. Preliminary analyzes show that conditions differ in their ability to promote initial sophistication of epistemological beliefs in future teachers.

Aggression-management competence development: the effect of online clinical simulations

Keywords: Competencies, Pre-service teacher education, Qualitative methods, Technology

Presenting Author: Delphine Franco, University of Ghent, Belgium; **Co-Author:** Martin Valcke, Ghent University, Belgium

Although reacting properly to students' aggressive behavior in the classroom is considered a key competence, novice teachers often report feeling ill-prepared to deal with problem behavior. One possible explanation is the lack of authentic learning experiences provided by initial teacher training programs. Current study investigates if online clinical simulations could have a positive effect on the development of the aggression-management competence of pre-service teachers. More concrete, we focus on their situation-specific skills (i.e. perception, interpretation and decision-making) which are, according to Blömeke, Gustafsson and Shavelson (2015), central aspects of the competence development continuum.

In total, 215 pre-service teachers enrolled in a one-year university level teacher training program were asked to participate in the intervention (i.e. online clinical simulations). After coding the answers of the students to calculate their index scores on both the pre- and post-simulation, preliminary analysis of 92 answers demonstrates that each situation-specific skill improved significantly. This suggests that online clinical simulations are indeed a promising approach to foster the aggression-management competence mastery of pre-service teachers.

Session B 14

12 August 2019 13:45 - 15:15

Seminar Room - S07

Poster Presentation

Higher Education, Learning and Instructional Technology, Lifelong Learning

Learning and Educational Technology

Keywords: Assessment methods and tools, Competencies, Computer-assisted learning, Computer-supported collaborative learning, Content analysis, E-learning/ Online learning, Educational technology, Engineering, Higher education, Informal learning, Interdisciplinary, Learning analytics, Learning Technologies, Lifelong learning, Metacognition, Peer interaction, Professions and applied sciences, Self-regulation, Writing/Literacy

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 17 - Methods in Learning Research, SIG 25 - Educational Theory, SIG 27 - Online Measures of Learning Processes

Chairperson: Ivy Lau, The University of Hong Kong, Hong Kong

Word count and helpfulness ratings in online peer reviews: creating effective learning environments

Keywords: Assessment methods and tools, Computer-supported collaborative learning, Peer interaction, Writing/Literacy

Presenting Author: Sarah Faye, University of California, Davis, United States

Online peer reviews have become a regular feature of writing courses because they enable students and instructors to gather data on the class progress during peer reviews. Writing instructors have already published extensive studies on this data to analyze students' feedback strategies, but less attention has been put on how this data can serve the pedagogical goals of instructors. This presentation will discuss ongoing research that has been collected during a Business Writing course at the University of California, Davis, to highlight how the data gathered through online programs during peer reviews can shed light on the effectiveness of an instructor's assignment sequence and peer review instructions. Online programs like Eli Review allow us to gather data on the struggles peer reviewers have with known and unknown genres, and on how international students can participate most productively as peer reviewers in a class with native speakers. This, in turn, provides instructors with insight on their teaching. The focus of this research is the correlation between word count and helpfulness ratings during online peer reviews to 1) improve assignment sequence and types of questions and feedback in peer reviews to create a stronger peer review environment; 2) not just level the scale between native speakers and international students through anonymous peer reviews, but also capitalize on different types of skills to improve the learning environment.

Measuring higher education students' engagement through multimodal data

Keywords: Educational technology, Higher education, Learning analytics, Learning Technologies

Presenting Author: Pieter Vanneste, KU Leuven, Belgium; **Co-Author:** Annelies Raes, KU Leuven, Belgium; **Co-Author:** Ine Windey, KU Leuven, Belgium; **Co-Author:** Fien Depaep, KU Leuven, Belgium; **Co-Author:** Wim Van den Noortgate, imec-ITEC, KU Leuven campus Kulak Kortrijk, Etienne Sabbelaan 51, 8500 Kortrijk, Belgium; Faculty of Psychology and Educational Sciences, KU Leuven, Dekenstraat 2, 3000 Leuven, Belgium, Belgium

Measuring and keeping track of engagement is important as it has been shown to be a good predictor of students' grades and achievement test scores (Connell, Spencer & Aber, 1994; Marks, 2000; Skinner, Welborn & Connell, 1990), and students' retention and graduation in education (Furlong & Christenson, 2008). However, engagement is a multifaceted construct involving cognitive, affective and behavioural dimensions (Dobbins & Denton, 2017). Furthermore, engagement is considered as malleable, as it results from an interaction of students with their context and is as such responsive to contextual changes (Finn & Rock, 1997). The relevance of engagement for learning together with its multifaceted and malleable nature make it an interesting but challenging construct to study. Many of today's innovative research projects aim to measure aspects of learning in real-time and display this information on a teacher's dashboard to cognitively support teachers as to "augment their intelligence". This study aims to unravel indicators for student engagement, the latent variable of interest, by

identifying (a combination of) relevant indicators from manifest variables. For this purpose, 45 Bachelor students were monitored during six face-to-face lectures of 90 minutes. Self-report data were collected using validated questionnaires based on the Self-determination theory and were compared with the following real-time manifest variables: Web-browser data, log-data on students' behaviour on a platform for interactive quizzes, audiovisual data and psycho-physiological data. The ultimate purpose of this approach is the omission of these obtrusive self-reports, by learning an algorithm that can measure student engagement in real-time.

Supporting learners' self-regulated learning in Massive Open Online Courses

Keywords: E-learning/ Online learning, Learning analytics, Metacognition, Self-regulation

Presenting Author:Renee Jansen, Utrecht University, Netherlands; **Co-Author:**Anouschka van Leeuwen, Utrecht University, Netherlands; **Co-Author:**Jeroen Janssen, Utrecht University, Netherlands; **Co-Author:**Rianne Conijn, Tilburg University, Netherlands; **Co-Author:**Liesbeth Kester, Utrecht University, Netherlands

Massive Open Online Courses (MOOCs) offer learners the freedom to decide over the place, time, and pace of their study. However, in order to successfully deal with the autonomy offered in MOOCs, learners must engage in self-regulated learning (SRL) activities. In this study, we present the results of a SRL intervention implemented in three MOOCs. Learners in the intervention group were presented several short videos in which a peer model explained the importance of SRL and gave practical advice on how learners' could improve their SRL. After each video, learners were prompted to apply the SRL activities as learners rated the usefulness of the advice and wrote down how they could improve their SRL. The effects of the intervention on learners' SRL, measured both with a questionnaire and with trace data indicators, as well as on learners' course completion will be reported.

Heuristics in software modelling: An eye tracking study

Keywords: Competencies, Engineering, Higher education, Professions and applied sciences

Presenting Author:Florian Hauser, Regensburg University of Applied Sciences, Germany; **Co-Author:**Rebecca Reuter, Regensburg University of Applied Sciences, Germany; **Co-Author:**Andreas Gegenfurtner, University of Passau, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany; **Co-Author:**Jürgen Mottok, Regensburg University of Applied Sciences, Germany; **Co-Author:**Ivonne Hutzler, Regensburg University of Applied Sciences, Germany

To investigate the role of heuristics in the domain of software engineering, an eye tracking study was conducted in which experts and novices were compared. The study focused on one of the most challenging parts in this domain: the generation of an object model for a software product based on a requirements specification. During their training, software engineers are taught different techniques to solve this task. One of these techniques is the noun/verb analysis. However, it is still unclear to what extent novice and expert programmers are making use of it. Ideally, the noun/verb analysis works as a heuristic and helps programmers to make fast and accurate decisions. Participants in the study were 40 software programmers at four levels of expertise (novices, intermediates, experienced programmers, experts). They were presented with ten decision tasks. In each task, participants read a requirement specification and then had to choose one out of three presented class diagrams that they considered the best solution. During the task, their eye movements were recorded. Results show that all participants used the noun/verb analysis as a heuristic. Programmers with higher levels of expertise, however, outperformed programmers with lower levels of expertise. Interestingly, the more experienced programmers were not following the noun/verb analysis in a blindfolded way. They realised that the noun/verb analysis would produce diagrams, but a skilled software architect would not model them in this way. Instead they created their models in a way that they perceived as more logical and realistic.

The E-Learning Setting Circle: Critical Issues for E-Learning Research and Theory Development

Keywords: E-learning/ Online learning, Educational technology, Interdisciplinary, Learning Technologies

Presenting Author:Marco R uth, University of Cologne, Germany; **Co-Author:**Kai Kaspar, University of Cologne, Germany

Decades of research on e-learning have led to an extensive amount of evidence on how learning with technological interventions takes place. However, a continuously growing body of empirical evidence entails very heterogeneous and partly neglected project contexts, structures, and contents. On the one hand, this diversity is partly necessary due to results from important inductive or innovative approaches allowing for particular advances in the field. On the other hand, it can hamper progress in e-learning theory development on a larger scale. To account for the latter, we developed the E-Learning Setting Circle, an extensible model that depicts eleven critical issues for progress in e-learning theory development. Specifically, the model highlights the fundamental importance of project goals and decision-making and outlines the role of specific elements relating to context, structure, and content in e-learning projects. Considerations of the model in e-learning research could increase the generalizability and comparability of available and future evidence on learning with technology and thereby advance e-learning theory development.

Informal learning via using webpages and its potential for developing financial literacy

Keywords: Computer-assisted learning, Content analysis, Informal learning, Lifelong learning

Presenting Author:Baerbel Fuerstenau, TU Dresden, Germany; **Co-Author:**Mandy Hommel, TU Dresden, Germany

Financial literacy is among the 21st century skills necessary to master the challenges and problems of our time. Financial literacy can be acquired via formal education or informal learning. An often chosen option to learn informally is to consult the internet. In a study, we analysed whether informal learning via using online information supports the development of financial literacy about mortgages. Forty-five students participated in the study. They were randomly assigned to an experimental group (EG), or a control group (CG). EG participants explored webpages of a German bank, whereas participants of the CG did not explore webpages. Students of both groups worked on a case and decided about taking a mortgage. In addition, they administered a knowledge pretest and posttest. The results show that informal learning using webpages not necessarily supports the development of financial literacy. Therefore, forms of formal instruction should complement informal learning.

Session B 15

12 August 2019 13:45 - 15:15

Seminar Room - S06

Poster Presentation

Culture, Morality, Religion and Education, Higher Education, Learning and Special Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Attitudes and Beliefs

Keywords: Attitudes and beliefs, Communities of learners, Conceptual change, Educational Psychology, Emotion and affect, Higher education, Morality, Motivation, Philosophy, Quantitative methods, Science education, Self-efficacy, Social development, Social interaction, Special education, Writing/Literacy
Interest group: SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 12 - Writing, SIG 13 - Moral and Democratic Education, SIG 15 - Special Educational Needs

Chairperson: Markus H. Hefter, Bielefeld University, Germany

The influence of teaching approach on students' conceptual learning in Physics

Keywords: Attitudes and beliefs, Communities of learners, Conceptual change, Science education

Presenting Author:Christian Tarchi, University of Florence, Italy; **Co-Author:**Lucia Bigozzi, University of Florence, Italy; **Co-Author:**Federica Stefanelli, University of Florence, Italy

Physics is fundamental to secure future needs for scientific and technological competence, but many countries experience a drop in students' performances in international assessments, as well as in rates of enrolment in undergraduate programs in scientific disciplines. Socio-constructivist theories have produced a reforming movement in several educational systems, in particular in the area of sciences, but teacher often consider them an idealistic view of education and do

not consider themselves metacognitively competent enough to foster thinking in the classroom. In this study we investigated the efficacy of different teaching methods on high school students' conceptual knowledge of physics, after the effect of science-related beliefs and critical thinking skills was controlled. We adopted a mixed-method with sequential design, in which quantitative and qualitative data flow are inter-mixed. In specific, we interviewed four high school physics teachers to identify teaching approaches (qualitative approach) and compared them in terms of efficacy on students' performances (quantitative approach). Four teachers and 77 10th grade students participated. Teachers were interviewed during the school years, and asked questions about their teaching experience, their teaching approach and their epistemic beliefs. Students performances in Science-related beliefs, critical thinking, and conceptual knowledge in physics were evaluated twice, at the beginning and at the end of the school year. Results from the complex samples GLM revealed statistically significant differences on posttest scores in conceptual knowledge in physics. Overall, the study contributes to our understanding on current teaching practices in school, and their effect on students' conceptual understanding of physics concepts.

Understanding Students' Perceptions of Writing Feedback

Keywords: Attitudes and beliefs, Educational Psychology, Emotion and affect, Writing/Literacy

Presenting Author: Sarah Marrs, Virginia Commonwealth University, United States; **Presenting Author:** Sharon Zumbrunn, Virginia Commonwealth University, United States; **Co-Author:** Eric Ekholm, Virginia Commonwealth University, United States

The ways in which students perceive the feedback they receive on their writing can either foster or inhibit other important writing beliefs, such as their motivation, self-efficacy, self-regulation, and achievement (Ekholm, Zumbrunn, & Conklin, 2015; Magno & Amarles, 2011; Zumbrunn, 2013; Zumbrunn, Marrs, & Mewborn, 2016). However, our understanding of writing feedback perceptions is limited by the lack of psychometrically-sound measures. This two-part study sought to 1) develop a valid and reliable instrument for measuring students' perceptions of writing feedback, a relatively new construct and 2) confirm the factor structure of the resulting instrument and 3) explore factors that contribute to students' perceptions of writing feedback. In part one of the study, the Student Perceptions of Writing Feedback (PoWF) Scale, a self-report questionnaire that asks students how they perceive feedback they receive on their writing from their instructors was created. Items on the PoWF reflected the extant literature on students' feedback perceptions. Exploratory Factor Analysis (EFA) revealed students' writing feedback perceptions comprise three factors: writing improvement, positive affect, and negative affect. This measurement study was a critical first step toward a better understanding of students' writing feedback perceptions as well as related theoretical implications. Part two of the study confirmed the three factor model of feedback perceptions as measured by the PoWF and explored students' reasons underlying their scores on the PoWF through collection of qualitative data.

What is Inclusion – Developing a Questionnaire to Assess Concepts of Inclusive Education

Keywords: Attitudes and beliefs, Philosophy, Quantitative methods, Special education

Presenting Author: Jennifer Lambrecht, University of Potsdam, Germany; **Co-Author:** Stefanie Bosse, University of Potsdam, Germany; **Co-Author:** Katja Bogda, University of Potsdam, Germany; **Co-Author:** Jessica Jaeuthe, University of Potsdam, Germany; **Co-Author:** Nadine Spörer, University of Potsdam, Germany

What is inclusion? Despite the fact, that there is no consensus on what inclusion is, inclusive education is implemented in schools and research on inclusive education is conducted. However, as long as the meaning of inclusion is unclear within as well as between different groups of stakeholders (e.g., teachers, politicians, and researchers), the implementation of inclusive education is challenging to govern and research findings are hard to interpret. Therefore, this study aims to develop an economically efficient questionnaire to assess what inclusion means with respect to children with special educational needs. The theoretical background of this questionnaire is the theory of inclusion as a trilemma (Boger, 2015). The core of the theory consists of three basic sentences defining inclusion as normalization, deconstruction or empowerment, with only two definitions being true at the same time. Building on this theory we developed a questionnaire to assess concepts of inclusive education within persons. In this study, we aim to test, if it is possible to assess inclusive concepts within persons with a questionnaire and which answering formats are suitable. The questionnaire was tested with N = 200 teacher students, data analyses are currently conducted.

Acquiring entrepreneurial competences in higher education studies: learners' preliminary intentions

Keywords: Attitudes and beliefs, Higher education, Motivation, Self-efficacy

Presenting Author: Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain; **Co-Author:** Richard Tunstall, University of Leeds, United Kingdom; **Co-Author:** Susan Whittle, University of Leeds, United Kingdom; **Co-Author:** Karen Burland Clark, University of Leeds, United Kingdom

Entrepreneurship education enables individuals to acquire competences needed to be entrepreneurial. Entrepreneurial intentions have been used to assess changes in students' attitudes and mind-set. Subject disciplines engender different norms and expectations of students (Becher & Trowler, 2001) and the development of intentions, motivations and perceptions over the duration of different university programs is a complex phenomenon which has been insufficiently studied. The CEES delivers 'with Enterprise' undergraduate degree for students who want to combine a specialist subject with enterprise. The aim of this paper is to evaluate learners' entrepreneurial preliminary intentions of non-business students studying entrepreneurship minor programs. To do so, we focus on entrepreneurial intentions with a sample of 174 students (27% from the 'with Enterprise' program). The instrument used was Ajzen's (1991) adaptation from Moberg's (2014) work. Findings point out that attitudes towards entrepreneurship are very positive but intentions to act entrepreneurially are quite low. Differences were found at an inter-group level: social support to become an entrepreneur is higher in 'with Enterprise' group; they perceived that entrepreneurship is linked to positives attitudes; and their entrepreneurial intentions are higher. Gender differences were also found. This study also help us understand that by enhancing students' competences in innovation and entrepreneurship, we give them the opportunity to establish a powerful relationship with the society as well as the useful competences they need to successfully engage with the labor market and hence the society (Bueno Campos & Casani Fernández de Navarrete, 2007).

Exploring Happy Victimization in the context of business and organizations

Keywords: Emotion and affect, Morality, Social development, Social interaction

Presenting Author: Karin Heinrichs, Pädagogische Hochschule Oberösterreich, Austria; **Presenting Author:** Christian Schadt, Georg-August-Universität Göttingen, Germany

Immoral behaviour such as corruption, bullying or unfair behaviour seems to be quite common among managers and employees at their work place. They are expected to act in order to fulfil their tasks at the workplace in line with their professional identity or ethos. Additionally, work always takes place under restrictive (economic) conditions. Happy Victimization (HV) thereby indicates that people transgress moral rules and report that they feel "good" doing so. Thus, to explore whether adults respond to situations of low moral intensity at the workplace with the HV pattern, we conducted a survey study with n=310 students of different study programs. Results reveal happy victimizing to be a situation specific pattern that can be found quite frequently even in the working context. People intending victimizing attribute significantly worse emotions than people deciding for moral behaviour. Moreover, participants seem to try to see themselves as morally better persons than most of their colleagues. They rate their colleagues to show victimizing more often compared to their own intentions. To discuss implications for vocational education, situation-specificity of moral decision-making has to be taken seriously in regard to fostering the perception of morally relevant situations, moral decision-making as well as self and emotion regulation. Results also indicate that situations of low moral intensity may lead to a variety of patterns of moral decision-making and emotion attributions that they could be used in educational settings.

Session B 16

12 August 2019 13:45 - 15:15

Seminar Room - S09

Poster Presentation

Developmental Aspects of Instruction, Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Assessment methods and tools, Competencies, Design based research, E-learning/ Online learning, Experimental studies, In-service teacher education, Integrated learning, Mathematics, Mixed-method research, Model-based reasoning, Pre-service teacher education, Quantitative methods, Science education, Teacher professional development, Teaching/instruction, Video analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Chiel vander Veen, VU University Amsterdam, Netherlands

Learning journals support knowledge integration of history teacher students

Keywords: Experimental studies, Integrated learning, Pre-service teacher education, Teaching/instruction

Presenting Author:Christina Schuba, Albert-Ludwigs-University Freiburg, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Abstract The integration of pedagogical knowledge (PK), pedagogical content knowledge (PCK), and content knowledge (CK) is an important requirement for becoming a proficient history teacher. Integrating knowledge from separately taught disciplines is a complex task. Even though research has shown that writing learning journals is a powerful learning tool, empirical findings on the effects of learning journals on the individual development of competences in teacher education are scarce. Instructional support is needed to overcome this deficit. Therefore, we investigated informed prompting and learning-journals examples as methods to support history student teachers' reflective thinking and knowledge integration by journal writing. In a 2 x 2 experimental study with college students (current N = 50), we analyzed the effects of two modes of instruction: informed prompting and the provision of a learning-journal example. Informed prompting provided background information on reflective thinking highlighted the importance of arguing and weighing for integrating PK, PCK and CK. A learning-journal example modelled how reflective thinking can be applied to inter-relate CK, PCK and PK. First results suggest that the informed prompting is highly effective to support intertextual connections written in the learning journals by history teacher students.

Development of an Instrument for Measuring Teachers' Knowledge of Mathematical Equivalence

Keywords: Assessment methods and tools, Mathematics, Teacher professional development, Teaching/instruction

Presenting Author:Emine Simsek, Loughborough University, United Kingdom; **Co-Author:**Ian Jones, Loughborough University, United Kingdom; **Co-Author:**Iro Xenidou-Dervou, Loughborough University, United Kingdom; **Co-Author:**Margaret Dowens, The University of Nottingham Ningbo China, China

Primary students' understanding of mathematical equivalence has become a major area of investigation, and standardised tests have been developed with the purpose of assessing students' conceptions of the equals sign. However, research has paid less attention to teacher knowledge in this context. This study focuses on development and evaluation of a standardised instrument for measuring teachers' knowledge of their students' understanding of mathematical equivalence. The development of the instrument was based on a literature review, and a pilot study with five primary school teachers (in the UK) was undertaken to check the clarity of the instrument items. The final instrument was comprised of four items asking teachers to identify possible correct and incorrect students' answers when solving equivalence questions. As part of a cross-cultural study, primary school teachers from across three countries, namely China, the UK, and Turkey completed the teacher instrument. The overall aim of this poster is to show whether the developed instrument holds validity and reliability and is appropriate for use to measure teachers' knowledge of their students' understanding of mathematical equivalence in three countries. Results will be presented in the final version of the poster as data are still being processed.

Are educational sciences too soft? Student teachers' attitudes towards educational sciences

Keywords: Pre-service teacher education, Quantitative methods, Teacher professional development, Teaching/instruction

Presenting Author:Joerg Wittwer, University of Freiburg, Germany; **Co-Author:**Thamar Voss, University of Freiburg, Germany; **Co-Author:**Helen Ernst, University of Freiburg, Germany

To become a proficient teacher, student teachers enrolled in teacher education programs need to acquire content knowledge, pedagogical/psychological knowledge and pedagogical content knowledge. However, in contrast to content knowledge, it might appear not to be necessary to receive formal preparation to acquire pedagogical/psychological knowledge. This is because student teachers, in line with research showing a general skepticism of psychology, might have negative attitudes towards pedagogical/psychological knowledge. To address this question, we conducted an empirical study in which we examined student teachers' beliefs about educational sciences (e.g., pedagogics, psychology) and contrasted them against their beliefs about the sciences of the subjects (e.g., physics, history). The results showed that educational sciences were viewed as less complex, easier to learn, less structured but more subjective than the sciences of the subjects. The findings suggest that educational sciences appear to have a lower inherent difficulty than the sciences of the subjects, which seems to make the learning of educational sciences particularly easy. At the same time, the characteristics assigned to educational sciences might indicate that educational sciences are perceived as fuzzy and lacking scientific rigor. Such a skeptical attitude might negatively influence a student teacher's professional development. Therefore, it seems to be useful to provide student teachers with a more realistic picture of how educational sciences work and to support student teachers in more accurately judging the challenges faced when acquiring knowledge in educational sciences.

Learning tasks: Which role do they play in music lessons? A mixed-method approach

Keywords: Competencies, Mixed-method research, Teaching/instruction, Video analysis

Presenting Author:Sandra Degen, University of Zurich, Switzerland

In connection with the competence-oriented teaching, especially learning tasks began to capture the attention of empirical teaching research and improvement of teaching. As a result of PISA and TIMSS, the discussion about relevant criteria of good tasks as well as the analysis and construction of domain-specific learning tasks increased in recent years. At present, didactic research focused on learning tasks with a musical-didactic perspective is still missing. There is a lack of basic empirical knowledge about the common music teaching practice in public schools and the application of learning tasks in music lessons. The study wants to make a contribution in order to close this research gap and investigates the music teaching practice in ten fifth-grade and sixth-grade classes in the German-speaking part in Switzerland by using a mixed-method approach (video-based classroom observations, stimulated recall interviews, qualitative content analysis of learning tasks and competence test). My contribution describes the research and will illustrate the instruments to analyse data by means of appropriately selected examples of the learning environment. Finally, I discuss the relevance of the results of the video-based classroom observations for teachers' daily school life.

Planning for sensemaking: What do pre-service teachers consider when designing modeling activities?

Keywords: Model-based reasoning, Pre-service teacher education, Science education, Teaching/instruction

Presenting Author:Candice Guy-Gaytán, University of Nevada, Reno, United States

The *Next Generation Science Standards* are intended to shift instruction such that student activity parallels scientists' activity. However, translating scientific practice into classrooms is difficult because the scientific endeavor is inherently complex: scientists engage in various practices to systematically generate and evaluate new and historical understandings. One such practice, modeling, can be a powerful means to engage students in the scientific process; however, teachers may have difficulty actualizing modeling due to beliefs about students' capacity to generate knowledge, time needed for planning sensemaking activities, and willingness to let students grapple with complex ideas. At the elementary level (Kindergarten-fifth grade), these factors may be amplified due to constraints on what can be taught and when, and teachers' understanding of science. Pre-service teachers (PSTs) could be key to ensuring science is taught in elementary classrooms because they have the time and support to experience, plan, and practice sensemaking. This study examined this problem space to better understand what PSTs considered as they planned modeling lessons intended to foreground sensemaking. All PSTs experienced opportunities to themselves engage in modeling and were asked to develop units based on their experiences. Findings suggest that PSTs can bring to bear the science activities they experienced in class, yet tensions arising through the lesson planning process highlight that PSTs struggle with providing opportunities to observe and think about causes of a phenomenon versus providing a "finalized" model for students to confirm.

Designing Flexible, Web-based forms of Professional Development to Impact Teacher Learning

Keywords: Design based research, E-learning/ Online learning, In-service teacher education, Mathematics

Presenting Author:Nanette Seago, WestEd, United States; **Co-Author:**Elizabeth Dyer, WestEd, United States

Although video-based professional development has shown great potential to support teacher learning, much of the research focuses on face-to-face formats, which do not capitalize on the benefits of using digital platforms for professional learning. This study reports on the design, development and preliminary research on the adaptation of existing video-based mathematics professional development materials to digital formats that can be used in individual self-paced, facilitated cohort-paced, or group-paced environments. Preliminary results indicate that mathematics teachers and teacher educators found the adapted materials useful and engaging. The results also identified ways to improve the materials and suggest that a balance between individual reflection and interactive formats is important for supporting engagement.

Session B 17

12 August 2019 13:45 - 15:15

Seminar Room - S02

Poster Presentation

Assessment and Evaluation, Learning and Instructional Technology, Learning and Social Interaction, Learning and Special Education, Teaching and Teacher Education

Literacy

Keywords: Cognitive development, Comparative studies, Design based research, Educational technology, Experimental studies, Language (L1/Standard Language), Learning and developmental difficulties, Learning disabilities, Literacy, Mathematics, Parental involvement in learning, Peer interaction, Primary education, Problem solving, Science education, Social development, Teacher professional development, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 12 - Writing, SIG 15 - Special Educational Needs

Chairperson: Rola Ajjawi, Deakin University, Australia

Peer assessment to enhance primary school pupils' oral competencies. The peer best designed feedback

Keywords: Language (L1/Standard Language), Literacy, Peer interaction, Primary education

Presenting Author:Stéphane Colognesi, Université catholique de Louvain (UCL), Belgium; **Presenting Author:**Liesje Coertjens, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Caroline Vassart, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Benoit Blondeau, Université catholique de Louvain (UCL), Belgium

Research shows (Colognesi & Dolz, 2017; Nolin, 2015; Sénéchal & Chartrand, 2011) that teachers feel ill prepared for teaching and evaluating oral competences. They require guidance (de Pietro, Fisher & Gagnon, 2017). Works on *assessment for learning* (Earl, 2003) suggest that pupils can be included in the evaluation process to enhance learning. It is unclear however which form of peer-evaluation is most efficient. This study examines two conditions of peer-evaluation: pupils negotiating their feedback in smaller sub groups (1) and pupils individually elaborating their feedback for the others (2). Two classes of 10-12 year olds (42 pupils) from one school over a period of 16 lessons of 50 minutes each took part in the research. Results show that the oral competence improved in both classes and that in the class where feedback was negotiated had the strongest progress.

Prevalence and stability of comorbid reading and arithmetic fluency problems in primary school

Keywords: Learning and developmental difficulties, Learning disabilities, Literacy, Mathematics

Presenting Author:Mikko Aro, University of Jyväskylä, Finland; **Co-Author:**Jenni Puttonen, University of Jyväskylä, Finland; **Co-Author:**Riikka Heikkilä, University of Jyväskylä, Finland; **Co-Author:**Tuire Koponen, University of Jyväskylä, Finland

Reading and arithmetic problems are known to often be comorbid, although the prevalence estimates of the overlap vary, at least partly due to varying operationalization of the skills between studies. However, research on developmental reading and mathematical disabilities shows that a central manifestation of both of these problems relates to fluency, i.e. rate of performance. Explicit focus on fluency has been rare in comorbidity research. Further, the studies focusing on the stability of the observed comorbidity are lacking, with the exception of recent study by Koponen et al. (2018). This study aimed at investigating the prevalence and stability of comorbid reading and arithmetic fluency problems in a sample of 1385 children. The participants were students at grade levels 2-5 in the beginning of the one-year follow-up. The results showed that depending on the cut-off score, 28-43% of children with either reading or math fluency problems had also overlapping problems in the other domain. The comorbid fluency problems were also more stable during the follow-up as compared to single problems in one domain only. The results indicate that overlapping fluency problems should be paid close attention to already in the early grades. Furthermore, the findings raise the question of possible underlying common problems affecting the developmental shift towards direct retrieval instead of serial processing in the basic skills of word recognition and basic arithmetic.

Reference to Rhetoric: Children's Metalinguistic Awareness and their Achievement in Writing

Keywords: Cognitive development, Language (L1/Standard Language), Literacy, Writing/Literacy

Presenting Author:Maira Newton, University of Auckland, New Zealand

Children's metalinguistic awareness is their ability to view language as an object and reflect upon it. The present study investigates the relationship between children's metalinguistic awareness and their achievement in writing. It is a two phase mixed methods study. The participants in the first phase were 84 year three to six children in a multicultural Auckland primary school. They each completed a New Zealand e-asTTle writing test and a Controlled Oral Word Association (metalinguistic) Test. There was a significant relationship ($r=.37$) between writing performance and metalinguistic ability. Thirty two children from the 84 were purposively selected in four achievement groups for the second phase of the study. They completed think alouds, as they wrote a paragraph, followed by questions about their writing. These were transcribed and instances of metalinguistic awareness were coded and counted. Analyses of the think alouds revealed no significant associations between the total frequencies of verbalised instances of metalinguistic awareness and writing achievement, however there was a statistically significant relationship between metalexical awareness and writing performance ($r_s=.51$, p

Cultivation of STEM professionals: Evidences from top-15 participating economies in PISA 2015 Study

Keywords: Comparative studies, Literacy, Problem solving, Science education

Presenting Author:Soi-kei Mak, University of Macau, Macao; **Co-Author:**Pou Seong Sit, University of Macau, Macao; **Co-Author:**Kwok-cheung Cheung, University of Macau, Macao; **Co-Author:**Man-kai leong, University of Macau, Macao

In the first decade of the 21st century, in many basic education systems around the world, educational researchers and practitioners are active to promote STEM (i.e., Science, Technology, Engineering, and Mathematics) education for the K-12 students. At end of 2016, it was timely that both the main survey data and key findings of Programme for International Student Assessment (PISA) 2015 Study, hosted by Organisation for Economic Cooperation and Development (OECD), were released to the public, rendering opportunities for the researchers to examine issues concerning cultivation of STEM professionals. PISA 2015 assessed 15-year-old students' literacy in three core domain areas, i.e., language, mathematics and science. Special to PISA 2015 is that in this cycle of PISA assessment there was an optional component concerning with the assessment of student collaborative problem solving (CPS) through computer simulation systems. Through analyses of the top-15 high-performing basic education systems the percentage of the high-performing students who are proficient in CPS and at the same time proficient in at least two of the three core literacy domains assessed in PISA 2015, as well as examination of relevant descriptive statistics concerning students' expectation for embarking on a career related to STEM at age 30, countries/economies analyzed in this study will be better informed on the cultivation of competent STEM professionals to meet the challenges of the 21st century.

Improving preschool language outcomes via professional development: an RCT

Keywords: Experimental studies, Literacy, Social development, Teacher professional development

Presenting Author:Sandra Mathers, University of Oxford, United Kingdom; **Co-Author:**Iram Siraj, University of Oxford, United Kingdom

The Using Research tools to improve Language in the Early Years (URLEY) study is a cluster randomized controlled trial designed to evaluate the benefits of a year-long professional development (PD) programme for early childhood educators. One hundred and twenty-two state-maintained primary schools in two disadvantaged areas of England were recruited and allocated to an intervention group (60 schools) and a business-as-usual control group (62 schools). Child language and socio-behavioural development (2,500+ children) was assessed prior to randomisation, and again six months after the programme had ended. Quality of practice was assessed using observational rating scales prior to randomisation and in the last month of the programme. The intervention comprised six days of training and up to three days of individual in-school mentoring support. Using a set of evidence-based Language Learning Principles, it aimed to improve educator's knowledge of how children learn language and how to support that development. Educators were also trained to use observational research tools to observe and reflect on their own practice and identify areas for improvement, supported by their mentor.

The intervention is being externally evaluated in order to ensure objectivity and rigour, and results are not yet available to the intervention team. They will be released in spring 2019, and EARLI 2019 will be the first presentation of findings at an international conference, should this proposal be accepted.

Enhancing the home language environment using digital technology

Keywords: Design based research, Educational technology, Literacy, Parental involvement in learning

Presenting Author:Alex Hodgkiss, University of Oxford, United Kingdom; **Co-Author:**Sandra Mathers, University of Oxford, United Kingdom; **Co-Author:**Fiona Jelley, University of Oxford, United Kingdom

This study investigates methods of using technology to support parents in enhancing children's language and literacy at home. It has the dual aims of enhancing research knowledge in the area of digital technology and parental engagement, and contributing to the development of technologies within the real world (i.e. the development of a concrete product or intervention). The research draws on emerging thinking in design-based research and professional development intervention, which aims to address the disconnect between educational research and design practice, and avoid use of large-scale experimental trials to evaluate poorly designed programmes. Key features include iterative cycles of design, enactment/implementation, analysis, and redesign; a strong emphasis on stakeholder involvement; and rigorous comparison of different designs during the early stages of development.

Drawing on these methodological frameworks, alongside evidence on language development, parental engagement and digital technologies, the research is taking place in three iterative phases: information-gathering; initial development/piloting; and a small-scale experimental trial which aims to assess and understand impact on relatively low-cost proximal outcomes (e.g. parent knowledge/behaviour, parent-child relationships) in a robust manner. This research will provide rich insights into change process (i.e. what might change, how, for whom and in which ways) in order to inform successful design. The findings will feed into further development and refinement of the technology, in preparation for a full research trial testing child outcomes. The study is in the early stages and will have findings available from Stage 2 (development and piloting) available for EARLI 2019.

Session B 18

12 August 2019 13:45 - 15:15

Seminar Room - S13

Poster Presentation

Cognitive Science, Instructional Design, Motivational, Social and Affective Processes, Teaching and Teacher Education

Mixed-method Research

Keywords: Achievement, Case studies, Collaborative Learning, Conversation/ Discourse analysis, Emotion and affect, Learning and developmental difficulties, Metacognition, Mixed-method research, Primary education, Qualitative methods, Quantitative methods, Secondary education, Special education, Teacher professional development

Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs, SIG 16 - Metacognition, SIG 17 - Methods in Learning Research

Chairperson: Sari Yrjänäinen, University of Turku, Finland

Support Programmes at Primary Schools - a Multimethod Study of Good-practice Schools

Keywords: Case studies, Learning and developmental difficulties, Mixed-method research, Primary education

Presenting Author:Stefanie Schnebel, University of Education Weingarten, Germany; **Co-Author:**Sandra Langer, University of Education Weingarten, Germany

Support Programmes at Primary Schools - a Multimethod Study of Good-practice Schools

A number of support programmes have lately been established at Austrian primary schools, acknowledging diversity and heterogeneity and therefore supporting integration by providing special funds and resources.

Successful support programmes do not only rely on resources, but also and especially on the use of the funds (Perlman & Redding 2009; Reusser, Pauli & Strebler 2015). School culture, arranging teaching and learning environments and teacher's expertise are factors for successfully establishing extensive support programmes (Perlman & Redding 2009; Scheerens 2013, Creemers & Kyriakides 2008). By using a multi-perspective research approach, it was evaluated how additional resources are used to further improve support programmes at primary schools. A special focus was set on how support programmes have been established and implemented at successful schools (e.g. Bohl et al. 2016; Masters 2009). For detailed analysis, a qualitative approach using interviews and observation in good-practice schools was used. Findings show that factors of collaboration, school leadership and communication have stronger influence than structural aspects. It will be discussed how through the methods used, key factors of support programmes and their implementation have been gained that have validity beyond the singular incident.

Characteristics of planning, implementation and evaluation of additional professional support

Keywords: Mixed-method research, Primary education, Secondary education, Special education

Presenting Author:Tina Vrsnik Perse, University of Maribor, Slovenia; **Co-Author:**Marta Licardo, University of Maribor, Slovenia; **Co-Author:**Katja Košir, University of Maribor, Slovenia

The characteristics of planning, implementation and evaluation of additional professional support is one of the greatest challenges regarding the successful and inclusive education of students with special educational needs in Slovenia and elsewhere. This was the ultimate research question in the National Evaluation Study of different forms of Additional Professional Support that is assigned for children with special needs according to the Placement of Children with Special Needs Act (Vršnik Perše et al., 2016) that was carried out in 2015/2016 school year on a large representative sample of school professionals in Slovenia. There were main characteristics analyzed regarding the planning, implementation and the evaluation of additional professional support on the level of elementary schools and upper secondary schools. There were several interesting characteristics and also good practices reported regarding the planning, implementation and evaluation but mostly great differences between elementary and upper secondary school level were identified. Based on the results of the analysis the guidelines for schools and education professionals were suggested. Also a systemic approach to better measures for improving inclusion of students with special needs appears to be one of the needed measures to be taken both on the policy level and schools level nationally and internationally.

Eliciting socially shared metacognitive regulation in ill-structured problems

Keywords: Collaborative Learning, Conversation/ Discourse analysis, Metacognition, Mixed-method research

Presenting Author:Mari Ader, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Jan van Bruggen, Open University, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands

Most of the problems that students face in their education are oriented towards one correct solution with one optimal pathway to that solution, whereas most of

the problems encountered in real life are not. These ill-structured problems are used in the current study to research socially shared metacognitive regulation (SSMR). SSMR reflects a group of learners' goal-directed regulation of their cognitive processes during a collaborative learning activity. Most research done in SSMR has utilized a well-structured problem-solving process which follows a linear process towards the solution. Only a few studies have focused on SSMR in ill-structured problem solving. The current research aims to propose a framework for investigating SSMR utterances in ill-structured problem-solving processes in which problem solvers move back and forth between orientation, problem solving and evaluation processes and no solution is 'right' or 'wrong'. Secondly, in order to understand how to support SSMR, this study employs the framework created to investigate the effect of prompts on SSMR processes. 70 university students solved a design task in their course in which half of the groups received prompts to elicit SSMR. Detailed results will be presented at the conference and possible implications are discussed.

Teaching immigrant children: A multi-method approach to teacher identity negotiation

Keywords: Emotion and affect, Mixed-method research, Primary education, Teacher professional development

Presenting Author:Sotiria Pappa, University of Jyväskylä, Finland; **Co-Author:**Anneli Eteläpelto, University of Jyväskylä, Finland; **Co-Author:**Virpi-Liisa Kykyri, University of Jyväskylä, Finland; **Co-Author:**Josephine Moate, University of Jyväskylä, Finland

As societies are constantly shifting due to financial and political reasons, issues of harmonious integration of migrant population become a focal point for policies in the workforce and education. Yet, while there have been international initiatives to map and overcome integration challenges for migrant children, such as the Europe-supported Horizon2020 program on societal challenges, the teacher's perspective on the changing classroom realities remains a relatively unexplored area. This study investigates the professional identity negotiation and emotions of Finnish teachers teaching immigrant pupils through the medium of a foreign language. It applies a multi-method approach to address the psychophysiological and subjective experiences of emotional realities in teaching. The study draws on data from five Finnish primary school teachers, using physiological measurements, stimulated recall interviews based on recordings, and self-reports via the online tool Emotion Circle. The findings discussed will focus on the relation between teachers' physiological responses to stressful classroom situations and their retrospective meaning-making processes. Moreover, future methodological directions and implications will be addressed.

Examining Teachers' Strategies to Judge Student Achievement from a Cue Utilization Perspective

Keywords: Achievement, Mixed-method research, Primary education, Teacher professional development

Presenting Author:Chunjie Zhu, University of Passau, Germany; **Co-Author:**Qiguang Yang, Jiangnan University, China; **Co-Author:**Detlef Urhahne, University of Passau, Germany

The lens model of social judgment theory (Brunswik, 1955) was applied to understand teachers' judgment of student achievement and their strategies of information processing. Through the use of a semi-structured questionnaire, it should be investigated if and to what extent teachers utilize different types of student cues. The sample consisted of $N = 260$ teachers from seven Chinese primary schools. They were asked to select and rank the student cues from seven information sources that help them to judge student achievement. It was found that teachers made use of all information categories. Teachers developed a clear hierarchy of data sources to judge student achievement. The best information was rearing from student abilities and attitudes and the least important information from student demographics. More specifically, among students' abilities and attitudes, teachers selected general intelligence, interest, and learning strategies as the leading cues. Concentration was selected and ranked as the most important behavior during class. Among various test information to judge student achievement, teachers mainly considered students' last test performance. Whether students finish homework on time and independently were for teachers more important than correctness of homework. Questioning and communicating with teachers were regarded as important cues after class to judge student achievement. Parents' educational level played a higher role for teachers than students' age, gender or physical appearance. Furthermore, teachers obtained important cues about student achievement from conversations with parents and other teachers. To make more precise predictions, teachers should be informed about more valid indicators of student achievement.

Network analysis as a unifying element in quantitative and qualitative research approaches

Keywords: Mixed-method research, Qualitative methods, Quantitative methods, Special education

Presenting Author:Mathias Mejez, University of Bern, Switzerland

Discussions about the appropriate usage of research methods have a long tradition. Since the late 1950's an increasing effort of merging qualitative and quantitative research approaches is certainly recognisable but the design and construction of mixed-methods-concepts remains controversial and sometimes even their resolution is required. This poster is a contribution to a controversial debate as it suggests the application of network analysis to dissolve the problem of blurry boundaries between qualitative and quantitative research. For this, a study will be presented where analyses are based on legal and administrative documents as well as on a survey of 136 persons concerned with special education (parents, teachers, therapists, psychologists, principals and remedial teachers). The results of the study show, that network-analysis is a suitable instrument to mix qualitative and quantitative research at different levels of the research process.

Session B 19

12 August 2019 13:45 - 15:15

Seminar Room - S03

Poster Presentation

Learning and Social Interaction

Social Interaction in Learning and Instruction

Keywords: Attitudes and beliefs, Cooperative/collaborative learning, Emotion and affect, Learning approaches, Mathematics, Peer interaction, Qualitative methods, Second language acquisition, Secondary education, Self-efficacy, Social aspects of learning and teaching, Student learning, Video analysis, Writing/Literacy

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Hege Hermansen, University of Oslo, Norway

Nurturing the fluid body language of receptive-responsive dialogue – Key pedagogic challenges

Keywords: Peer interaction, Qualitative methods, Social aspects of learning and teaching, Video analysis

Presenting Author:Eva Vass, Western Sydney University, Australia; **Co-Author:**Gabriella Deszpot, Liszt Academy of Music, Hungary

In our attempts to reimagine education it is crucial to recognise bodily ways of knowing and experiencing as fundamental to learning. Bringing together dialogic orientations and Natural Inclusionality (Rayner, 2017), our research contributes to this paradigm shift. It uses the Kokas pedagogy as its explorative context – an experience-centred approach to music education involving musically inspired free movement. Our previous work has reported on the significance of the pedagogy for music education, music teacher education, and for educational practice in general. The current paper problematizes the implementation of this pedagogy in mainstream school contexts. The research involved observations in a Year 1 class of a primary school in Hungary. The data include video recordings of ten Kokas sessions, creative products (paintings, drawings) and fieldnotes of informal reflective conversations between researcher and teacher. Through the qualitative analysis of the data we charted students' journeys towards deep, collective musical affinity: the emergence of the fluid body language of receptive-responsive dialogue. The analysis captured students' difficulties and barriers, reflected in their movement repertoire and/or reflections. It also documented how the teacher responded to these pedagogic challenges. This research exemplifies how we can approach the art of (collective) being and becoming. Here we see free, improvised movement as the pedagogic route towards musical affinity, a route enriched by shared transformative experiences. Musical knowledge evolves from such mutually co-creative relationships. However, the study shows the complexity of this pedagogic undertaking. It unpacks the key challenges in implementing such explorative, experience-centred pedagogy, informing both research and practice.

Time on Task of Students in Inclusive Classrooms - Results of a multi-perspective video analysis

Keywords: Cooperative/collaborative learning, Peer interaction, Student learning, Video analysis

Presenting Author: Bianka Troll, Leuphana Universität Lüneburg, Germany; **Co-Author:** Michael Besser, Leuphana University of Lüneburg, Germany

Dealing with diversity at school can be considered as a key challenge for inclusive education. The aim of inclusion is to reduce exclusion and discrimination and to increase educational opportunities and participation for all learners. Several studies highlighted that cooperative learning can support participation of all learners in class. Among others, participation can be seen as time on task the students spend during class. Time on task can be considered as one relevant predictor of student learning as well as an indicator of cognitive engagement. For the present study the question arise how the individual preconditions of students in inclusive classrooms influence the time on task the students spend in interactive phase of cooperative learning sessions. First results of a multi-perspective video analyses show that there are significant differences in students' time on task depending on individual preconditions.

What is learning for secondary-school students? Students' perceptions examined in Brazil and Finland

Keywords: Qualitative methods, Secondary education, Social aspects of learning and teaching, Student learning

Presenting Author: Juliene Ferreira, University of Tampere, Finland

In the present study, learning in school was studied from the students' perspectives in two different national contexts. The aim was to explore students' learning experiences in school by identifying what are the core elements of learning for secondary school students. We conducted the study with a qualitative approach in which photos taken by the students during their school routines were used to elicit group discussion about how learning is experienced and defined. Participants were two groups of 13-15-year-old students, one from Finland and one from Brazil. Results show that the anatomy of learning is varied in students' experiences and that their perceptions of learning in school are defined by the way students signify the interaction with others, their relation with materials, their understanding of the pedagogical actions and practices, and how learning is contextualized by time. The study contributes to discussions on how to consider and incorporate students' perspectives into the development of pedagogical practices, and by the dialogue between Finnish and Brazilian perspectives, we point out core elements for the learning experiences of secondary school students raising questions of learning processes as complex and culturally contextualized.

Learning Language using a Digital Communication Plattform

Keywords: Learning approaches, Peer interaction, Second language acquisition, Writing/Literacy

Presenting Author: Kristin Kibsgaard Sjøhelle, Volda University College, Norway

In this presentation I will be highlighting some of the findings from an intervention study which explored and documented different approaches to language learning in a Norwegian high school setting (Sjøhelle, 2016). Traditional teaching of the written language *Nynorsk* as a second language variety, is usually done through a grammar-translation approach, and can serve as an example of traditional second language teaching. The intervention study points at the challenges of making the second language function as a tool for communication among learners, and explores language learning through other teaching methods. One such is the use of a symmetric digital communication platform, which encouraged the students to discuss and reflect upon their thoughts on learning to write *Nynorsk*, and at the same time to use the language to communicate digitally with each other. My findings show how this method of language training opens a new arena for writing, that engages the students and encourages them to focus more on communication than correct spelling. And at the same time it throws a light on how different types of writers experience such a communication situation differently, and how this need to be taken into account when teaching a written language.

Anxiety, Mathematics Performance and Profession Preference of Students. A Longitudinal Study

Keywords: Attitudes and beliefs, Emotion and affect, Mathematics, Self-efficacy

Presenting Author: Laurain Fares, University of Haifa, Israel

The current longitudinal study aims at investigating how career preferences are affected by anxiety and mathematics performance, and how this association develops over time with increasing social and pedagogical demands (during the shift from middle to high-school). Hence, we ran numerous questionnaires and tasks on 100 middle school 9th graders, to follow up on them in a longitudinal manner, and to re-study them in the consecutive year, as they will be in high school. In addition, we administered an occupational preferences questionnaire which was developed for the current research (A norm questionnaire has been administered in order to examine the professions' mathematicity level). Results show that anxiety levels (mostly trait anxiety), as well as math performance were significantly associated with professional preference with high mathematicity for middle school students. In addition, the impression of the possibility to successes in professions with high mathematicity related the desire to choose these careers. For high school students, this connection between the possibility to successes and preference with high mathematicity was more prominent, while the correlations between anxiety levels, math performance and career preferences were weaker. The results suggest that the association between anxiety, mathematics performance and math - related career preferences change with increasing social and pedagogical demands. Moreover, former research show that math self-efficacy is strongly related to mathematics anxiety as well as to preference of math related careers. Accordingly, we recommend that future intervention programs aiming to reduce mathematics anxiety levels, will pay attention to students' occupational self-efficacy

Session B 20

12 August 2019 13:45 - 15:15

Seminar Room - S15

Poster Presentation

Higher Education, Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Teacher Professional Development

Keywords: Collaborative Learning, Communities of practice, Educational technology, In-service teacher education, Mixed-method research, Reflection, Secondary education, Teacher Effectiveness, Teacher professional development, Workplace learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Anne Nevgi, University of Helsinki, Finland

An Analytic Framework for Inter-organizational Collaboration in Inclusive Education

Keywords: Communities of practice, Secondary education, Teacher professional development, Workplace learning

Presenting Author: Jantien Gerdes, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Sui Lin Goei, Windesheim University of Applied Sciences, Netherlands; **Co-Author:** Mariette Huizinga, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Doret de Ruyter, University of Humanistic Studies, Netherlands

An Analytic Framework for Inter-organizational Collaboration in Inclusive Education This paper develops an analytic framework for studying inter-organizational collaboration between schools and child support services. Collaboration between schools and child support services is of broad interest in Western Europe and the USA. The opportunities for boundary crossing and expansive learning render collaboration between institutions an objective worth striving for. In order to improve collaborative practice, a deeper theoretical understanding of collaborative processes is needed. Empirical research shows that actors in inter-organizational collaboration value trust related issues and transparency related issues. By analyzing the distinct dimensions of these concepts and their interrelatedness with dimensions of co-work, a framework for thinking about inter-organizational collaboration is constructed. The framework consists of dimensions of joint work in relation to dimensions of knowledge sharing, dimensions of trust, the collaborative identity continuum, and the formality of interaction continuum. The analytic framework suggested in this paper serves as a heuristic model to get a firmer grip on what is happening in collaborative contexts. The value of the framework lies in the potential opportunity to arrive at new insights. This will contribute to the development of theory and to new perspectives on improving practice.

Veteran and Novice Teacher Participation in Collaborative Reflective Inquiry

Keywords: Communities of practice, Reflection, Teacher professional development, Workplace learning

Presenting Author: Livat Eshchar - Netz, Ben-Gurion University of the Negev, Israel; **Co-Author:** Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel; **Co-Author:** Adam Lefstein, Ben-Gurion University of the Negev, Israel

Studies examining teacher professional communities usually focus on novice teachers' learning and initiation into the profession, with veteran teacher learning receiving little consideration. In this case study, we examine veteran teachers' participation in a teacher community and how their participation shapes discourse and learning processes. Employing linguistic ethnographic micro-analytic methods, we investigate a video-recorded language arts teacher community meeting in Israel. Three teachers - two positioned as veterans and one as a novice - discussed a lesson taught by the novice teacher. The study addresses the following questions: What are the unique characteristics of veteran versus novice teacher participation in community meetings? How does veteran participation affect the participation and positioning of other teachers? What are the ramifications of these participation patterns for inquiry and learning processes? We found that the veteran teachers were generally not inclined to engage in inquiry and indeed limited all participants' opportunities to do so. In contrast, the novice teacher challenged others' ideas and thereby advanced the discussion. The analysis shows that the didactic logic that governed the community and the meeting, according to which the veteran's role is to teach and the novice's role is to learn, limits veteran engagement in inquiry and exacerbates power relations in the community. Furthermore, the didactic style of leading the meeting, which positions the other teachers as students, intensifies tensions between veteran and novice. The setting, including the physical organization in the space, participant roles, and activity design, influenced participation patterns, power relations and the quality of inquiry.

Reforming Vocational Teacher Education - Workplace-orientated and Technology enhanced approach

Keywords: Educational technology, Mixed-method research, Teacher professional development, Workplace learning

Presenting Author: Jiri Vilppola, Tampere University of Applied Sciences, Finland; **Co-Author:** Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:** Katja Vähäsantanen, University of Jyväskylä, Finland

Abstract: In Finland, vocational teachers are working mainly in vocational schools and in universities of applied sciences. As Finnish vocational education and training (VET) system is moving towards competence-based and individualized practices, there is a need to study vocational teacher education. This study aims to produce new knowledge on how workplace-orientated and technology enhanced learning environment promote the development of teacher' different competencies and identity needed as a vocational teachers.

This qualitative research engages in both longitudinal and cross-sectional approaches. The data is gathered with mixed methods (e.g. written stories and diaries) during May 2018 – December 2019 during the vocational teacher training process of one student group (longitudinal approach, n=20). There is also an open web-based questionnaire for graduated teacher students (cross-sectional approach, n= 60). All participants of the study are vocational teacher students, who are already working as a (non-qualified) vocational teachers. The findings will show how the teacher students were found to exhibit different identity trajectories, competencies and digital skills through the education, including varying degrees of continuity and transformation.

Teacher-reflection and organizational knowledge development in master-teacher programmes in Hungary

Keywords: Collaborative Learning, In-service teacher education, Reflection, Teacher professional development

Presenting Author: Krisztián Urbán, Eötvös Loránd University, Hungary; **Co-Author:** Judit Szivák, Eötvös Loránd University, Budapest, Hungary; **Co-Author:** Nóra Rapos, ELTE University, Faculty of Education and Psychology, Hungary

Schools have been interpreted as special organizations for long decades by several researchers (Wenger, 2006). These organizations are undoubtedly more and deeper than the simple collection of its members; they form a complex system, the characteristics of which influence the effectiveness of teachers who work there (Silins, Zarins and Mulford, 2002). These systems, just as individual teachers, can use reflection as a trigger for organizational learning (Knipfer et al, 2013). On the other hand, teachers can also develop organizational knowledge through their transformative learning practices that might become part of the professional capital of the school (Hargreaves and Fullan, 2012). Thus, the question arises whether individual reflective thinking might also support the development of organizational knowledge through knowledge management practices within the school. This paper outlines the connection between the presence of reflective thinking and the aims to develop school organizations in Hungarian master-teacher programmes. The status of master-teacher was introduced to the Hungarian educational system in 2015 with the aim of conceptualizing an innovative interpretation of teachers, who might have the professional potential to renew the wider systems (schools, educational system) around themselves through various practices. The *Research Group for Organization, Teacher and Teacher Education* of ELTE's Institute of Education coded 813 master-programmes, which were then subjected to quantitative analysis, as a part of which we examined how individual reflective thinking can correspond with organization-developmental goals.

Exploring the impact of a PD training on history teachers' reading strategy instruction

Keywords: Educational technology, Mixed-method research, Secondary education, Teacher professional development

Presenting Author: Marlies ter Beek, University of Groningen, Netherlands; **Co-Author:** Marie-Christine Opendakker, University of Groningen, Netherlands; **Co-Author:** Marjolein Deunk, University of Groningen, Netherlands; **Co-Author:** Jan-Willem Strijbos, University of Groningen, Netherlands

Reading comprehension is an important skill in secondary education, yet many teachers find it difficult to provide adequate reading strategy instruction in their content area classrooms. Teachers do not feel competent enough or lack information about the various needs of their students. In this research intervention, we designed a digital learning environment to support teachers' instruction based on student performance profiles. Teachers of classrooms in the experimental condition were provided with a detailed overview of student performance profiles focusing on students' text comprehension and self-regulated learning behaviour, such as time spent on task and whether students consulted supportive hints. In the second part of the intervention, these teachers received a training and a detailed guide on how to interpret these profiles and how to translate it into structured, explicit instruction. Teachers of classrooms in the control condition were only provided with basic information about student's progress and correctness of multiple-choice questions. Results show that classrooms in the control condition initially received significantly more strategy instruction during their lessons. However, after the second part of the intervention, there were no differences between both research conditions. Teachers of classrooms in the experimental condition with access to performance profiles improved their reading strategy instruction and provided more explicit instruction compared to teachers of classrooms in the control condition.

Audio diaries: developing pre-service teachers' reflective practices

Keywords: In-service teacher education, Reflection, Teacher Effectiveness, Teacher professional development

Presenting Author: Noemi Birta-Szekely, Babes-Bolyai University, Romania

Abstract: This small-scale qualitative study involved seven pre-service teachers and was conducted to provide them with an opportunity to engage in reflective practice. By creating audio diaries during the six-month practicum period, participants recorded guided reflections (trigger questions sent by the researchers) on their teaching practice in a sustained manner. This resulted in 6 hours of audio material which was analyzed by using the grounded theory approach. Results revealed that pre-service teachers engaged in a critical reflection through using mobile technologies and their reflection revolved around issues of time management, emotional dimensions of doing the practicum, and supervision. **Keywords:** reflection, teacher training, audio diaries, professional self-knowledge.

Session B 21

12 August 2019 13:45 - 15:15

Seminar Room - S01

Poster Presentation

Motivational, Social and Affective Processes

Motivation

Keywords: Achievement, Culture, Educational Psychology, Emotion and affect, Goal orientation, Higher education, Informal learning, Language (Foreign and

second), Language (L1/Standard Language), Motivation, Primary education, Quantitative methods, Reading comprehension, Secondary education, Self-efficacy, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Tine Nielsen, University of Copenhagen, Denmark

It's still learning a language: Motivational profiles for learning own and new languages

Keywords: Language (Foreign and second), Language (L1/Standard Language), Motivation, Secondary education

Presenting Author: Quint Oga-Baldwin, Waseda University, Japan; **Co-Author:** Luke Fryer, The University of Hong Kong, Hong Kong

Numerous theorists have offered opinions about the differences between learning a new language and other school subjects. At the same time, little empirical evidence for the differences has been brought forward. In this study, we aimed to address the motivational differences and similarities between learning a new (foreign) language and learn one's own language in formal school settings using the framework of self-determination theory. Rather than comparing variable level differences, we looked at a large representative sample of Japanese secondary school students ($n = 830$) to demonstrate person-centered differences using latent profile analysis. Results indicated the sample was divided into five theoretically consistent subgroups, with similar patterns of motivation and achievement across language domains. Roughly 55% of the sample fit into the same subgroup, indicating that the majority of students' motivation for learning a language was similar across school subjects.

A Multilevel, Longitudinal Examination of Students' and Teachers' Growth Orientation in Mathematics

Keywords: Educational Psychology, Motivation, Quantitative methods, Secondary education

Presenting Author: Emma Burns, University of New South Wales, Australia; **Presenting Author:** Keiko Bostwick, UNSW, Australia; **Co-Author:** Andrew Martin, University of New South Wales, Australia; **Co-Author:** Rebecca Collie, University of New South Wales, Australia; **Co-Author:** Tracy Durksen, University of New South Wales, Australia

Using a multilevel, longitudinal model, we examined associations between student, classroom, and teacher growth orientation (GO)—and student and classroom gains in mathematics engagement and achievement across one year. Recent cross-sectional research has shown that students' GO—comprising growth mindset, self-based growth goals, and task-based growth goals—is positively associated with mathematics outcomes. However, researchers have yet to examine if this composite growth construct is associated with mathematics outcomes at the classroom level, or if teachers' personal GO is associated with classroom outcomes. In addition, the cross-sectional nature of previous GO research could not assess if growth orientation is associated with changes in mathematics outcomes over time. In this study, we extend GO research and examine these additional aspects of GO by considering the multilevel nature of the data, the role of teachers, and associations with gains in mathematics outcomes across one year. Results demonstrated that student and classroom GO had positive associations with gains in both mathematics outcomes. Although teachers did not have a direct effect on classroom outcomes, there was a significant interaction effect such that teacher GO aided classroom engagement for the least growth-oriented classrooms. Theoretical and educational implications are discussed.

Quantitative Self-Efficacy Across the First Year of College: Trajectories by Gender and STEM Major

Keywords: Educational Psychology, Higher education, Motivation, Self-efficacy

Presenting Author: Jaeyun Han, University of Kentucky, United States; **Co-Author:** Ellen Usher, University of Kentucky, United States; **Co-Author:** Caihong Li, University of Kentucky, United States; **Co-Author:** Calah Ford, University of Kentucky, United States; **Co-Author:** Xiao-Yin Chen, University of Kentucky, United States; **Co-Author:** Kelsey Corcoran, University of Kentucky, United States; **Co-Author:** Cara Worick, University of Kentucky, United States; **Co-Author:** Christia Brown, University of Kentucky, United States

Although many studies have examined self-efficacy among university students, few have focused on how students' self-efficacy changes over time. The purpose of this study was to investigate changes in university students' quantitative-related self-efficacy during the first year of college. We first assessed the psychometric properties and time invariance of a measure designed to assess first-year college students' ($N = 3,003$) quantitative self-efficacy at three time points during the 2017-2018 academic year. The quantitative self-efficacy measure demonstrated strong factorial invariance across time. Second, we examined how students' quantitative self-efficacy changed over the course of their first year in college and whether these trajectories differed as a function of gender (59% women) and declared major (31% STEM majors). Latent growth curve modeling showed that students' quantitative self-efficacy increased significantly over the first year. Men's initial self-efficacy scores were significantly higher than women's, but men had a slower rate of change than did women. Students majoring in STEM disciplines had a significantly higher initial self-efficacy level but a slower rate of self-efficacy change than did non-STEM majors. Students' self-efficacy at the beginning of the academic year had no significant relationship to first-year GPA, but self-efficacy at mid-year and end-of-year was positively related to GPA. Although women majoring in STEM had lower self-efficacy than men, they had higher achievement. Findings suggest that researchers should consider how men and women's self-efficacy and its correlates evolve longitudinally as well as how these patterns vary by major.

Effects of different design features on the motivation to participate in non-formal music programs

Keywords: Culture, Informal learning, Motivation, Secondary education

Presenting Author: Kathrin Smolarczyk, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; **Co-Author:** Verena Wießnet, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany; **Co-Author:** Lisa Birnbaum, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; **Co-Author:** Stephan Kroener, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

Playing an instrument and participating in musical leisure activities is supposed to be valuable for children's cognitive abilities and their personal development (Müller, 2017). According to Keuchel (2013), among the biggest obstacles concerning cultural participation in leisure time is the mismatch of offered activities and the target group. Therefore, this study assessed determinants of the motivation to participate in voluntary non-formal music programs. In a 2*2 factor video vignette experiment, one of four websites including a video trailer advertising non-formal music programs was assigned to $N = 140$ students together with a questionnaire to assess the motivation to participate. Websites and video trailers differed in (1) setting and (2) music, both with the two values high vs. low proximity to youth culture. After controlling for gender and parental education, $F(2,135) = 21.63, p < .05, r^2 = .24$, results showed a substantial effect of the factors as a whole, $\Delta F(2,133) = 6.19, p < .05, \Delta r^2 = .07$, with a higher motivation to participate in the rock-pop than in the classical music conditions $T(135) = 3.02, p < .05$, but no statistically significant differences related to the setting, $T(135) = 1.69, p = .09$. Moreover, interactions between the factors or between factors and parental education were not statistically significant, $\Delta F(3,130) = 1.17, p = .32, \Delta r^2 = .02$. Implications of these findings for the design of future non-formal music programs for children and adolescents in terms of focusing on contemporary music and rock and pop instruments are discussed.

Exploring the Within-Person Structure of Motivation and Emotion

Keywords: Emotion and affect, Goal orientation, Motivation, Self-efficacy

Presenting Author: Ayame Tamura, Doshisha University, Japan; **Co-Author:** Ryo Ishii, Doshisha University, Japan; **Co-Author:** Ayano Yagi, Kochi University of Technology, Japan; **Co-Author:** Noriaki Fukuzumi, Kochi University, Japan; **Co-Author:** Aya Hatano, Japan Society for the Promotion of Science & Kochi University of Technology, Japan; **Co-Author:** Michiko Sakaki, University of Reading, United Kingdom; **Co-Author:** Ayumi Tanaka, Doshisha University, Japan; **Co-Author:** Kou Murayama, University of Reading, United Kingdom

Although there are various theories related to achievement motivation and emotion in education, little research has been conducted to comprehensively examine how these constructs are related to each other at an intra-individual level. The aim of this study was to examine the within-person structure of a broad range of motivation and emotion constructs by applying network analysis to the data collected with an intensive longitudinal design. Four post-graduate level researchers (2 men, 2 women, M age = 30.75, $SD = 4.50$) completed questionnaires on their motivation and emotion every evening for one year (595 observations in total). We conducted network analysis and estimated the contemporaneous network of the fixed-effect among a number of motivation and

emotion constructs. Results revealed a big cluster representing overall positive motivation and emotion (e.g., intrinsic motivation and happiness), while negative emotional elements (e.g., sadness and depression) formed a separate cluster. Interestingly, some negative motivation constructs (e.g., performance-approach/avoidance goals and extrinsic motivation) were isolated in the network, indicating that the negative motivation constructs may be more heterogeneous than positive types of motivation. Additionally, curiosity and effort seemed to link positive motivation/emotion and negative emotions. Furthermore, community detection analysis showed that the cluster of positive motivation/emotion was subdivided into several communities, and the organization of the communities suggests that motivation and emotion form separate communities, although they are still tightly linked. Findings provide a preliminary insight into the basic organization of motivation and emotion constructs operative in education.

The effects of nudges on reading motivation, reading frequency, and reading comprehension.

Keywords: Motivation, Primary education, Reading comprehension, Secondary education

Presenting Author: Lisa van der Sande, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Ilona Wildeman, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:** Adriana Bus, Vrije Universiteit Amsterdam, Netherlands

If children grow older, their reading motivation often decreases and many of them do not read often (Gottfried, Fleming, & Gottfried, 2001; OECD, 2010). Possibly, this decline can be countered by sending nudges to students or their parents. A nudge is a subtle hint to engage in particular behaviors (Thaler & Sunstein, 2008). In the present study, we investigated the effects of nudges in two contexts. First, we nudged parents of primary school students (grade 3-6) to engage in reading activities with their children. Second, we nudged secondary school students (grade 7-8) to read more frequently. At pre- and posttest, parents completed a questionnaire on the home literacy environment and their knowledge of children's books was assessed as an indicator of shared parent-child reading activities. Students in both primary and secondary school completed a questionnaire on reading motivation, a title recognition test (as an indicator of their reading behavior) and a reading comprehension test. In primary school, we expected that parents would engage in reading activities with their children more often after receiving nudges, which could have positive effects on their children's reading motivation, reading behavior, and reading comprehension levels. In secondary school, we expected that nudges might help students to read more often, which might have positive effects on their reading motivation and comprehension. The results of the present study contribute to more knowledge about how students and their parents can be stimulated to read more frequently.

Perfectionism and reasons behind goals - A closer look at striving for grades and success

Keywords: Achievement, Motivation, Quantitative methods, Student learning

Presenting Author: Antti Pulkka, National Defence University, Finland; **Co-Author:** Anna Tapola, University of Helsinki, Finland; **Co-Author:** Heta Tuominen, University of Helsinki, Finland; **Co-Author:** Markku Niemivirta, University of Oslo, Norway

This study focused on the associations between perfectionism (i.e., the level of standards and experienced discrepancy between one's goals and accomplishments) and motivational goals in educational context. The aim was to examine what kinds of perfectionism profiles could be identified among university students, and how these profiles were associated with reasons for striving for grades and success in university studies. We identified four profiles: non-perfectionist (relatively low standards, low discrepancy; 35.1%), ambitious (relatively high standards, low discrepancy; 18.4%), concerned (relatively low standards, high discrepancy; 21.6%), and perfectionist (high standards and discrepancy; 24.9%). For the ambitious, followed by perfectionists, positive feelings, instrumentality, mastery, and personal importance were more important reasons than for the other groups, especially when compared to the concerned. Then again, the perfectionists reported that impressing others and perceived expectations were more important reasons than they were for the other groups, especially when compared to the non-perfectionists. Interestingly, what comes to the perceived influence on self-esteem as a reason, the ambitious and perfectionists gave equally high importance for this particular reason, when compared to the other groups. Regarding appreciation and social comparison there were no differences between the groups. Students with different perfectionist profiles may endorse the same goals but with different sets of reasons. Reasons associated with a profile characterized by high standards represent positive stance towards achievement situations, but when high standards is combined with elevated discrepancy this adaptive pattern is appended by needs to appear competent and meet others' expectations.

Session B 22

12 August 2019 13:45 - 15:15

Lecture Hall - H08

Symposium

Learning and Social Interaction

Mixed Methods Social Network Analysis in Learning and Education: the Past, the Present, the Future

Keywords: Doctoral education, Mixed-method research, Qualitative methods, Social aspects of learning and teaching, Social development, Social interaction, Social sciences, Teacher professional development

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Bart Rienties, Open University, United Kingdom

Organiser: Dominik E. Froehlich, University of Vienna, Austria

Discussant: Jasperina Brouwer, University of Groningen, Netherlands

The present: Social network analysis has become an important theoretical and methodological framework to investigate learning and instruction. This importance is illustrated by the present surge in social network-related publications in this domain of research (from 37 in 2003 to more than 400 a decade later in the ERIC database), by EARLI's commitment in funding the 2018 Advanced Study Colloquium, and the publication of an edited volume about mixed methods social network analysis in the domain of learning and instruction. The past: More and more criticism is voiced against the high reliance on quantitative methods of past social network analysis. This is especially true for questions of learning and education, as the abstract notions of social networks tell little about what is being learned and why. The future: One solution that has been proposed is to include qualitative approaches on top of the quantitative procedures (Bolibar, 2015; Domínguez & Hollstein, 2014). Such mixed methods social network analysis (MMSNA) may resolve some of the limitations that a purely quantitative approach has. In this symposium, we will discuss how MMSNA is an interesting methodological approach to study learning, education, and instruction. The symposium features both conceptual contributions that clarify methodological questions about MMSNA and empirical contributions that show how and why MMSNA may be applied in research practice.

Networks of musicians at different expert levels

Presenting Author: Manuel Laengler, University of Regensburg, Germany; **Co-Author:** Markus Nivala, University of Gothenburg, Sweden; **Co-Author:** Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:** Tuire Palonen, University of Turku, Finland; **Co-Author:** Hans Gruber, University of Regensburg, Germany

Deliberate practice as a goal-orientated practice method enables individuals to reach an expert level within their domain. Research has shown that deliberate practice needs to be planned and supported by knowledgeable actors from their personal network (e.g. teachers, peers etc.). Surprisingly, there is little research in music expertise about those actors and how they support musicians during their musical career. The objective of this study was to examine how musicians at two different skill levels (expert/semi-professional) were supported by actors within networks for deliberate practice during their whole musical career. Case studies using semi-structured interviews investigated the ego-centric networks of ten musicians at different skill levels (five experts/five semi-professionals). The interviews were analysed abductively and a system of categories containing three main topics (childhood/apprenticeship/career), 18 categories for each topic, and 60 sub-categories was developed. Based on the interview data network maps for each career stage were drawn. An ego-centric network analysis was used to analyse the size, composition, structure, and quality of the networks. The results indicate that changes in the network composition within and between the three career stages supported the development of expertise within the expert group. Bandmembers were perceived as most important during their childhood and career stage and teachers during their apprenticeship stage. In contrast, amateur networks remained relatively stable over time and bandmembers were perceived as an important source for knowledge creation, but not for supporting deliberate practice.

Understanding the social transition experiences of doctoral students

Presenting Author:Jenna Mittelmeier, University of Manchester, United Kingdom; **Co-Author:**Bart Rienties, Open University, United Kingdom; **Co-Author:**Divya Jindal-Snape, University of Dundee, United Kingdom; **Co-Author:**Kate Zhang, The American University of Paris, France

Working towards a doctoral degree is both a rewarding and challenging experience, whereby students often encounter complex stressors that can profoundly impact their wellbeing. As it is apparent from recent studies that more resources are needed to encourage positive doctoral experiences, one consideration is the role of social communities, which previous research has outlined as an important source of support. However, while it is known that social communities are beneficial, there is currently limited knowledge about how students develop social communities and what institutions can do to maintain and support them. To address this, we conducted an in-depth investigation of doctoral students' experiences in an education department in the UK used a sequential mixed method design that incorporated reflective diaries, social network analysis surveys, and follow-up interviews. Our findings have provided transferable understandings about how doctoral students form networks with peers, as well as the situational and institutional mechanisms that support or hinder their experiences.

Unpacking beginning teachers' collegial network structure: A mixed-method social network study

Presenting Author:Laura Monique Thomas, Ghent University, Belgium; **Co-Author:**Melissa Tuytens, University of Ghent, Belgium; **Co-Author:**Geert Devos, Ghent University, Belgium; **Co-Author:**Geert Kelchtermans, Katholieke Universiteit Leuven, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

Educational researchers have shown enhanced awareness of the significance of teachers' interconnectedness. The push to capitalize on teachers' relationships resulted in an increase of the use of social network analysis (SNA). Notwithstanding its roots in both quantitative (e.g. graph theory) and qualitative research fields (e.g. ethnography), SNA has mainly been used in quantitative ways. Quantitative SNA has the capacity to identify structural patterns in and relational properties of networks in a systematic way. A drawback, however, is that this quantitative approach reduces the complexity of networks into numerical data. Qualitative methods focus on the network content and enable nuances in the interpretation of relational properties by including people's perceptions and sense-making of the network. The disadvantage of the qualitative approach is its lack of standardization in the identification of network structure. In this regard, the complementary strengths and weaknesses of quantitative and qualitative approaches call for mixed-method designs wherein both methods are used in conjunction. In this paper, an empirical application of mixed-method SNA is presented. The paper starts from the global issue that a considerable number of teachers leave the profession within the first years of practice. Although research has recognized that professional collegial relationships are paramount in preventing teachers' early exit, few studies have used the social network perspective to study their network in-depth. By using mixed-method SNA, the study aims to obtain a thorough investigation of beginning teachers' network structure and its relatedness to their job attitudes, as important precursors of teacher retention.

Mapping Mixed Methods Approaches to Social Network Analysis in Learning and Education

Presenting Author:Dominik E. Froehlich, University of Vienna, Austria

In this presentation, I create a map of mixed methods social network analysis research designs in education and learning research. For this, I review and code studies applying mixed methods (MM) social network analysis (MMSNA) in this research domain. I then use social network analysis to study how researchers sequenced qualitative and quantitative methods of data collection and data analysis. This work extends and complements previous theorizing on mixed methods research designs and the empirical work done by Bryman (2006). The unique perspective taken in this research allows a flexible yet thorough discussion of mixed methods designs in education and learning research. This is important for two major reasons. First, the generated map allows to study different MM designs within the SNA framework in a more nuanced, empirically grounded way. Second, it points to limitations within the current MMSNA literature (and potential solutions).

Session B 23

12 August 2019 13:45 - 15:15

Seminar Room - S05

Single Paper

Motivational, Social and Affective Processes

Self-Efficacy and Motivation

Keywords: Attitudes and beliefs, Educational Psychology, Motivation, Primary education, Psychometrics, Self-efficacy, Self-regulation, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Sonia Ilie, University of Cambridge, United Kingdom

Do achievement goals influence students' causal attributions for success in the context of writing?

Keywords: Attitudes and beliefs, Educational Psychology, Motivation, Self-efficacy

Presenting Author:Francesca Suter, University of Zurich, Switzerland; **Co-Author:**Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Carmen Hirt, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland

Our study investigates whether five different causal attributions of success can be predicted by achievement goals. Grammar school students (N = 569; 65 % female) completed self-report questionnaires about their achievement goals related to the writing of an academic certificate paper and their perceived success and attribution after receiving their achievement feedback (grade). A series of five two-step hierarchical multiple regressions was used to explore the relationship between achievement goals (mastery goal, performance-approach, performance-avoidance, work avoidance) and the attributions that students endorsed for success (effort, ability, luck, help from others and popularity of the student with the supervisor). To account for self-efficacy, gender and grades, these variables were entered as the first block in the regression. The four goal orientations were inserted as the second block. Results show that mastery and performance-approach goal oriented students tend to take credit for their successful outcomes, as they attribute their success to effort and ability. Approach-avoidance oriented students attribute their success rather to external causes. Work-avoidant students do not attribute their success to external factors, but they seem to know that their success is not due to their efforts. Overall, the present study provides insights into the relationship between achievement goal orientation and causal attribution in a real achievement context. The significance of the results for theory and practice will be discussed.

Development and Validation of the Situation-Specific Expectancy-Value Form of Learning Motivation

Keywords: Educational Psychology, Motivation, Psychometrics, Self-efficacy

Presenting Author:Kerstin Kisielski, TU Dresden - Psychology of Learning and Instruction, Germany; **Co-Author:**Susanne Narciss, TU Dresden, Germany

Abstract

Aim. This study aims at developing and validating a situation-specific expectancy-value form of learning motivation (EVF-LM), which measures motivation on a situation-specific level and in a multi-dimensional way. Thus, the EVF-LM's theoretical framework is rooted in integrative expectancy-value models of learning motivation (e.g. Eccles et al. 1983; Heckhausen & Rheinberg, 1980). The EVF-LM differentiates 13 subscales: 3 expectancies scales, 5 value scales and 4 cost scales. Due to the EVF-LM's design expectancies, values and costs can be measured on a situation-specific level. **Method.** This study examined the EVF-LM's factor structure with data collected from 394 university students. Maximum-likelihood confirmatory factor analyses were used to analyse the expectancy, the value and cost scales separately. For each scale two models were tested following (1) the hypothesized structure and (2) the factor structure suggested by previous exploratory analyses. **Results.** Following the model fit indices the structure analyses suggest a two factor structure for the expectancy scale: (1) perceived level of external and internal control and (2) instrumentality of outcome; a five factor structure for the value scale: (1) self-evaluation, (2) external evaluation, (3) utility value, (4) activity-related intrinsic value and (5) content-related intrinsic value; and a four factor structure for the cost scale: (1) loss of alternatives, (2) task effort, (3) emotional cost and (4) motivational interference. The trimmed model version for each scale demonstrated a good model fit. Internal consistencies yielded satisfactory to very good results for all factors. **Significance of the study.** Present findings support major assumptions regarding the

EVF-LM's theoretical structure. Furthermore, our results provide evidence that the EVF-LM is a context-sensitive instrument of motivation.

Relationships between the changes in interest, self-efficacy, and perceived difficulty during a task

Keywords: Educational Psychology, Motivation, Primary education, Self-efficacy

Presenting Author:Katariina Nuutila, University of Helsinki, Finland; **Co-Author:**Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:**Sirkku Kupiainen, University of Helsinki, Finland; **Co-Author:**Matthias Stadler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Heta Tuominen, University of Helsinki, Finland; **Co-Author:**Markku Niemivirta, University of Oslo, Norway

The aim of this study was to examine i) how situational interest, self-efficacy, and perceived difficulty change during a task, ii) how their initial levels and changes are related to each other, and iii) whether these initial levels and changes predict task performance.

Sixth-graders ($N = 1029$) worked on a complex problem-solving task, during which they rated their situational interest, self-efficacy, and perceived difficulty three times. Latent non-linear and piecewise growth curves were estimated for the constructs, and the correlations between their initial levels and slopes, as well as their predictive effects on performance were examined, after controlling for the effects of gender, achievement and intrinsic value.

Situational interest and self-efficacy declined in the beginning of the task, and perceived difficulty first increased, and then decreased during the task. Initial levels of situational interest and self-efficacy correlated positively with each other, but negatively with the perceived difficulty. Changes in situational interest and self-efficacy were highly correlated. While higher initial self-efficacy was related to steeper increase in perceived difficulty, and higher initial perceived difficulty, in turn, was associated with less steep decline in self-efficacy, decrease in self-efficacy was associated with steeper increase in perceived difficulty. After controlling for the significant effect of achievement, performance was positively predicted by initial level of situational interest, and negatively by the initial level of and change in perceived difficulty. Situational interest, self-efficacy, and perceived difficulty seem to contribute to each other during task engagement, although their levels and changes may have somewhat different predictive functions.

Promoting Motivational Regulation with a Learning Diary

Keywords: Motivation, Self-efficacy, Self-regulation, Student learning

Presenting Author:Thomas Martens, Medical School Hamburg, Germany

In this study, the effect of a specific learning diary on learning motivation and motivational regulation is examined in a combined longitudinal and intervention study. Specifically, the learning diary promotes self-reflection processes on learning methods and strategies that aim at the intention phase of the Integrated Model of Learning and Action (IMLA). A total of $n=157$ 7th and 8th grade pupils were examined at a district school in Northern Germany, of which two 8th classes with a total of 29 pupils took part in the 6-week intervention with learning diaries. Each week a learning method, such as mind-mapping, was tested and reflected using the learning diary. This reflection process was supported by short weekly one-to-one interviews with student trainers. Before and after the intervention period all pupils completed a questionnaire with the most important constructs of the IMLA and a scale on social emotional support. The analysis of the data was done with the Rasch model to identify person parameters as well as ANOVAs with repeated measures and moderator analysis. The results show a significant effect on self-efficacy and success experience in the learning diary group. The moderating effect of the prior social emotional support on the success of the learning diary has to be examined further. If the identified effects remain stable over time, the reflection processes initiated by the learning diary seem to be a very efficient way to increase motivational regulation and to promote important motivational constructs like self-efficacy.

Session C 1

12 August 2019 15:30 - 17:00

Lecture Hall - H09

SIG Invited Symposium

Lifelong Learning, Teaching and Teacher Education

SIG 3: Learning with Conceptual Change in Professional Working Life and Teacher Training

Keywords: Attitudes and beliefs, Conceptual change, In-service teacher education, Informal learning, Lifelong learning, Misconceptions, Science education, Self-regulation, Teacher professional development, Teaching/instruction, Workplace learning

Interest group: SIG 03 - Conceptual Change, SIG 14 - Learning and Professional Development

Chairperson: Gertraud Benke, Klagenfurt University, Austria

Organiser: Konstantinos Christou, University of Western Macedonia, Greece

Discussant: Lina Markauskaite, University of Sydney, Australia

Conceptual change theoretical frameworks have shown that students have intuitive beliefs about the physical world, mathematics, history, etc., that are often fundamentally different from the accepted ones, and they may stand in their way of learning in each domain. However, learning does not stop at the end of school. Throughout professional development, career-long learning continues most often in self-directed and unsupervised ways, that are not governed by formal curricula. In this context, prior knowledge and belief restructuring is often necessary as well. Research on expertise like pre-service and practicing teachers, on highly successful professionals like scientists, consultants, medical professionals, and on high-level performers, have shown that they often need to replace incorrect or inappropriate concepts and skills with correct or more appropriate ones. This process of fundamental knowledge revision is hindered by lack of awareness of their misconceptions but also by a body of strong beliefs they hold about knowledge and the learning process, which interfere their learning. Among other issues that will be raised in this symposium, we will try to answer questions such as: What can we learn from applying those already known about learning with conceptual change in studying expertise development as knowledge restructuring? How to design and implement learning environments that direct experts, in ways to evoke awareness of their misconceptions and epistemic beliefs which could lead to knowledge and belief restructuring and conceptual change? How teachers should be trained in ways that will make them more effective in helping their students become self-regulated life-long learners?

Teaching for conceptual change. How about the teachers?

Presenting Author:Erik Meij, Windesheim University of Applied Sciences, Netherlands; **Co-Author:**Anneke Smits, Windesheim University, Netherlands

Research was done on teacher beliefs about learning held by Dutch science teacher educators. Participants were asked to tell how convinced they were of statements presenting main principles of conceptual change theory translated to educational practice. Results showed that most principles were recognized but seldomly within a theoretical framework. Subsequent interviews confirmed that, first, most educators held personal beliefs of which some were based on theory or literature and some on experience and intuition. Secondly, there seemed to be a reluctance to see achievements from educational and psychological sciences as directional for educational practice. These two observations evoke questions. The first one is if conceptual change theory can fulfill the role of an overall theoretical framework for teaching. Second is how conceptual change can be established in teachers existing beliefs to make pedagogical decision making more based on learning principles.

Applying Conceptual Change Research to Teacher Professional Development

Presenting Author:Stella Vosniadou, Flinders University, Australia

A conceptual change perspective was applied to investigate pre-service and practicing teachers' beliefs about learning and teaching and to design an intervention to influence teachers' beliefs about learning and teaching in general and about self-regulated learning (SRL) in particular. The first part of the research investigated the hypothesis that pre-service and practicing teachers have beliefs about learning and teaching which are different from those presupposed by the SRL theoretical framework, and which might stand in the way of SRL knowledge and practices. A Beliefs about Learning and Teaching (BALT) Questionnaire was developed and used. The results showed that teachers have beliefs about learning and teaching that are negative predictors of beliefs in SRL and SRL practices and of the pre-service teachers' University grades. The second part of the research designed a successful intervention based on conceptual change research, which addressed teachers' beliefs about learning that were considered negative with respect to SRL.

How can knowledge restructuring and conceptual change be coupled?

Presenting Author:Hans Gruber, University of Regensburg, Germany; **Co-Author:**Jörg Marienhagen, University of Regensburg, Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

*Full title: How can knowledge restructuring and conceptual change be coupled? By marrying epistemic beliefs with deliberate practice*A core process of expertise development is knowledge restructuring through case-based reasoning – experts make use of their professional experience to adapt their knowledge, their routines, and their problem-solving capacities to the affordances and constraints of their workplaces. Similarly, models of conceptual change address deep information processing in order to replace wrong or inappropriate concepts by correct or more appropriate ones. Despite the similarities, few attempts exist to couple experts' knowledge restructuring and conceptual change. One reason might be that there are substantial differences in the underlying instructional tools and in the levels of proficiency of typical participants in the studies. While research on expertise focuses on deliberate practice of high-level performers, research on conceptual change focuses on student learning that can be stimulated by self-explanations or by reflective classroom discussions. These affect epistemic beliefs and thus inspire cognitive change. In this presentation, we suggest how to marry epistemic beliefs and deliberate practice by (a) reshaping the dimensions of epistemic beliefs to address issues of expertise development, (b) investigating how measures of epistemic beliefs can be transferred to professional learning contexts, (c) and discussing anew the nature of "good" and "appropriate" epistemic beliefs within expertise domains, in particular during deliberate practice activities. Examples of empirical evidence from our research are presented for each of these aspects.

Career-long Conceptual Change in the Medical Profession

Presenting Author:Els Boshuizen, Open University of the Netherlands, Netherlands

A recent review of misconceptions and weaknesses in the knowledge of medical students and professionals raised some issues related with advanced stages in their career. Both issues are rooted in the fast development of biomedical and specialist knowledge and techniques. One result is the super-specialisations that develop at the cost of general ability. Especially this lack of general ability can result in hypocognition. Another phenomenon is the rejection of knowledge and findings that are inconsistent with the biomedical belief system that dominates biomedical and clinical research and practice. This reductionistic, biomedical model of the human organism defines what are acceptable research questions, approaches, treatments, etc. This presentation will analyse these phenomena and will formulate educational implications and a research agenda.

Session C 2

12 August 2019 15:30 - 17:00

Lecture Hall - H07

SIG Invited Symposium

Learning and Social Interaction

SIG 17: Mixed Methods Social Network Analysis for Learning and Education

Keywords: In-service teacher education, Mixed-method research, Peer interaction, Qualitative methods, Quantitative methods, Social interaction, Social sciences, Student learning

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Jasperina Brouwer, University of Groningen, Netherlands

Organiser: Dominik E. Froehlich, University of Vienna, Austria

Discussant: Dominik E. Froehlich, University of Vienna, Austria

Social network analysis (SNA) has become an important theoretical and methodological framework to investigate the field of learning and instruction. This importance is illustrated by the surge in SNA-related publications in this domain of research—from 37 in 2003 to more than 400 a decade later in the ERIC database. However, more and more criticism is voiced against the high reliance on quantitative methods of SNA. One solution that had been proposed is to include qualitative approaches on top of the quantitative procedures. Such mixed methods social network analysis (MMSNA) may resolve some of the limitations that a purely quantitative approach has. In this symposium, we discuss the "Why" and "How" of MMSNA. Through four unique angles, we study both the theoretical and methodological underpinnings of this approach and concrete applications.

Around and around: The concentric circle method as powerful tool to collect MMSNA data

Presenting Author:Piet Van den Bossche, University of Antwerp, Belgium; **Co-Author:**Sara Van Waes, University of Antwerp, Belgium

Visualizations are an essential element of the social network paradigm (Freeman, 2004). Beyond the aesthetic value of visualizations, their power lies in allowing the conversion of quantitative data to qualitative and vice versa (Molina, Maya-Jariego, & McCarty, 2014). Network visualizations make it possible to communicate the structural features of social networks to laymen, and to communicate between researchers with different quantitative and/or qualitative backgrounds. As such, the explanatory power of network visualizations has been discussed extensively (Brandes, Kenis, & Raab, 2006; Freeman, 2005). Until now, network visualizations have often remained confined to the research lab. Yet recent work has extended its use to the field to collect network data (Hogan, Carrasco, & Wellman, 2007). In specific, a method using concentric circles has been set forward to co-construct personal networks with respondents in a straight-forward, dynamic and visual way (based on work by Antonucci, 1986; Hogan et al., 2007). This so-called 'concentric circle method' concerns a powerful tool to generate quantitative and qualitative network data. This contribution will demonstrate how the concentric circle method can be in various mixed method network designs (MMSNA) and for various research purposes, offering illustrations from empirical studies.

Social network analysis and activity theory: A symbiotic relationship

Presenting Author:Victoria Murphy, Open University, United Kingdom; **Co-Author:**Bart Rienties, Open University, United Kingdom; **Co-Author:**Allison Littlejohn, Open University, United Kingdom

Social network analysis (SNA) and activity theory are methodological approaches that originate from different schools of thought. Nevertheless, at their core both are concerned with understanding the interactions that take place between individuals or networks in order to achieve objectives. Each has strengths and weaknesses, and this talk will discuss how the combination of methods structured around SNA and activity theory frameworks can address some of the limitations of each approach; activity theory places networks in a detailed context, while SNA adds a structured understanding of potentially multiple types of relationship that exist within a community. However, when using both SNA and activity theory there are many underlying assumptions in both methods that must be taken into consideration. This can be especially complex when integrated in a mixed methods design. This talk will end by discussing some of the decisions that research teams must address when designing and carrying out research using SNA and activity theory.

The Role of Mixed-Method Social Network Analysis in Educational Sciences

Presenting Author:Natasa Pantic, University of Edinburgh, United Kingdom; **Co-Author:**Laura Monique Thomas, Ghent University, Belgium; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Sarah Galey, University of Edinburgh, United Kingdom; **Co-Author:**Dominik E. Froehlich, University of Vienna, Austria

Mixed-Method Social Network Analysis (MMSNA) are especially applicable in educational studies where both network structures and actors' psychological processes in social interactions are of interest. This paper outlines a definition of Mixed-method Social Network Analysis and a theoretical rationale for the use of MMSNA in educational sciences. Calls for mixing methods in Social Network Analysis come from a dual interest in the structures or form of social relationships (or 'outsider' view of the network) and the processes which generate these structures (the 'insider' view of the network). We posit that understanding the patterns of relationships in an outsider network requires quantitative methods, while the normative, culturally-embedded insiders' perspectives might be better understood with qualitative data. In addition, we consider the mixed-method designs that align to theories such as social capital, teacher agency and organisational change and illustrate the uses of such designs in educational studies, including whole network and ego-network approaches. The paper concludes with a brief discussion of possible future uses and the types of research questions that could be addressed with these methods.

Nomination data in classroom settings. SNA and peer relationships

Presenting Author:Tuire Palonen, University of Turku, Finland

The purpose of the presentation is to highlight how Social network analysis (SNA) and, especially, nomination (or ranking) data can be used to better understand students' peer relationships as regard to their social behavior and academic performance in school environment, or more generally, collaboration and participatory aspects among students. Social network analysis has developed many tools for this. First some theoretical expectations and concepts are presented regarding peer relationships. Secondly, methodological tools and instruments are introduced. Conclusions Students' ties with their peers are found to influence their school engagement to become more similar. Through mutual interaction, academically oriented students may become more school oriented together with school engaged students whereas the alienated ones hang out with other school disengaged ones leading to increase lack of motivation to engage in schooling. Presumable collaborative learning should be rooted to schools to enable collaborative learning with heterogenous peers in terms of gender, cultural backgrounds and school achievement.

Session C 3

12 August 2019 15:30 - 17:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Higher Education, Learning and Social Interaction

Analytical approaches for investigating knowledge co-creation in higher education

Keywords: Argumentation, Case studies, Collaborative Learning, Competencies, Content analysis, Higher education, Instructional design, Knowledge creation, Social aspects of learning and teaching, Student learning, Video analysis

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction, SIG 25 - Educational Theory

Chairperson: Hanni Muukkonen, University of Oulu, Finland

Organiser: Hanni Muukkonen, University of Oulu, Finland

Organiser: Crina Damsa, University of Oslo, Norway

Discussant: Monika Nerland, University of Oslo, Norway

This symposium discusses empirical studies of learning in higher education, which involve co-creation of knowledge. These studies are based on the recognition that the fast pace of knowledge development and nature of knowledge work across professions requires learning that prepares the students for these challenges. Such learning activities may involve working with complex knowledge and open-ended problems, understanding and applying principles and processes through which such knowledge is produced, validated and shared, or even (co-)creating knowledge. Research on co-creation processes has generated evidence on various types of benefits and challenges for learning (Moen, Mørch & Paavola, 2012). With this symposium, we address the need for a better understanding of what learners actually do when they need to bring their individual ideas and solutions together, whether and how they learn through co-creation of knowledge objects, and of self-assessment and evaluation in these contexts. The symposium aims to clarify and illustrate analytical approaches that are deemed suitable for examining co-creation processes. We analyze video of how students actually arrive at conceptual blending, themes in students' concrete work with various types of knowledge objects, episodes in group's social interaction and online communication. The analysis also examines knowledge objects the students work with, course materials and resources, and self-reported data on students experience with (authentic) collaborative knowledge work practices. These methods and results enable analysis of details through micro-analytical frameworks or on the big picture of how co-creation takes place, what are the relevant design decisions and evaluation foci for such educational activities

Constructing shared understanding of complex problems: An inscriptional blending perspective

Presenting Author:Natasha Arthars, The University of Sydney, Australia; **Co-Author:**Lina Markauskaite, University of Sydney, Australia

Increased emphasis has been placed on collaborative complex problem solving which requires division of intellectual labour and integration of different perspectives. In higher education there is currently little understanding of how intellectual labour is divided and how independently created knowledge is brought together. In this study we extended the conceptual blending perspective and analysed how groups develop shared understanding through combining individual insights and inscriptions to create a shared knowledge object. While teachers see the outcome of group problem solving, it is the process itself in which joint understanding is also grounded and therefore important to examine. Video recordings of students working collaboratively and creating shared representations of complex problems were analysed using an adapted conceptual blending scheme. We identified two important features of how students brought together their ideas and inscriptions. Firstly, it included a process of negotiation and development of a joint representational scheme, which is often overlooked in teaching and research. Secondly, blending moves of combining inscriptions went beyond visual mapping and included negotiation of meaning through combinations of dialogue, gesturing, writing, drawing and mirroring of bodily action.

Analyzing learning through co-creation of knowledge objects in software engineering education

Presenting Author:Crina Damsa, University of Oslo, Norway; **Co-Author:**Rachelle Esterhazy, University of Oslo, Norway

This study presents an analytical approach to processes of learning through project work that involves collaboration and co-creation of shared knowledge objects (software programs and website) in an undergraduate software engineering programme. In software engineering education, students have the opportunity to engaging in learning through inquiry, problem solving or collaborative creation of (digital) objects, practice that resemble authentic programming work. The analytical efforts to unveil how learning emerges in situations where students engage with complex processes of joint creation of knowledge objects are not a common contribution. Therefore, this study engaged with analyzing qualitatively the processes involved and the knowledge produced by groups of students working in both complex learning situations culminating with a digital product. A rich set of data (group discussions and products, online communication, sets of resources, observations) and the use of three sensitizing concepts enabled a detailed examination of these aspects. The findings emphasize the necessity for students to understand the strategies and knowledge underlying the (collaborative) programming practices, besides knowing how to apply these and to develop the capacity to explore, select and assess new knowledge resources; and, for the institutions, to provide the appropriate guiding structures for this type of learning activities.

Collaborative reasoning over domain knowledge and strategic processes - an exploratory case study

Presenting Author:Piia Naykki, University of Oulu, Finland; **Co-Author:**Jaana Isohätäälä, University of Oulu, Finland; **Co-Author:**Nikki Lobcowski, University of North Carolina at Chapel Hill, United States; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Jeff Greene, University of North Carolina, United States

Studies examining reasoning in collaborative learning have shown that reasoning benefits learners by allowing them to negotiate meanings and find discrepancies in understanding. However, studies have focused on reasoning over domain knowledge, such as science, but not explored reasoning over strategic processes, such as knowledge of the task, goals, strategies, motivation and emotion. This exploratory case study examines how reasoning over both domain knowledge and strategic processes emerge during collaborative learning of four teacher education students. The group's video-recorded face-to-face social interaction during mathematics tasks was qualitatively analyzed in detail using a theory-based coding scheme. The results reveal that the case group equally discussed both domain knowledge and strategic processes and that these discussions involved signs of collaborative reasoning. The analysis and illustrative examples shed light on how students shared ideas, elaborated and opposed each other in both reasoning over domain knowledge and strategic processes. The detailed case analysis extends prior research on reasoning and approaches discussions about strategic processes from a new perspective.

Learning knowledge work practices in different types of courses in agricultural sciences

Presenting Author:Minna Lakkala, University of Helsinki, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland; **Co-Author:**Hanna-Riitta Kymäläinen, Department of Agricultural Sciences, University of Helsinki, Finland; **Co-Author:**Liisa Ilomäki, University of Helsinki, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland

The main purpose of science universities is to educate students in domain-specific scientific content and skills, but also generic career skills and knowledge work competence should be promoted already during the studies. Present research focused on investigating students' experiences in three types of courses in agricultural sciences: substance-focused lecture courses with individual and collaborative home assignments, career skills courses including practicing of tasks relevant in current world of work (e.g., writing a CV and work application, team work or making a project plan), and customer project courses with a real project work assignment for a customer outside university. A questionnaire for students including statements and free-text questions, was used for self-assessing the learning of knowledge work competence and the evaluation of course experiences. Courses with assignments representing challenging teamwork and collaboration with external experts were evaluated educating collaborative knowledge work competence better than courses with simulated practices. Students valued different aspects depending on the course type: substance-focused courses were liked for good teaching, interesting content and appropriate assessment methods, career skills courses for collaboration and learning job-seeking skills, and customer project courses for collaboration and learning project work methods. Students appreciated the tasks where they did something real that have further use - producing individual job seeking documents or making project work for a real customer - whereas doing group tasks or a project plan just for practicing was regarded as unmotivating. Implications for further courses are discussed.

Session C 4

12 August 2019 15:30 - 17:00

Lecture Hall - H10

Symposium

Motivational, Social and Affective Processes

Implicit Theories in Education

Keywords: Achievement, Attitudes and beliefs, Goal orientation, Higher education, Motivation, Parental involvement in learning, Self-regulation

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Chairperson: Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Organiser: Katharina Kriegbaum, Heidelberg University, Germany

Discussant: Barbara Schober, University of Vienna, Austria

Implicit theories are important predictors of motivation, cognition and behaviour in different educational settings (Blackwell et al., 2007; Dweck & Legget, 1988; Hong et al., 1999). Mostly beliefs about the malleability of competencies are described on a continuum for „not malleable“ (entity theory) to „malleable“ (malleability theory) (Dweck, 2000). So far, research has mainly focused on implicit theories on intelligence taking a cross-domain perspective. This symposium addresses implicit theories in different education settings for early childhood to university and in samples of non-stigmatized and stigmatized populations (e.g., ethnic minorities). Various aspects of implicit theories are focussed: the experimental manipulation (paper 1, paper 3), determinants (paper 3) and consequences (paper 1, paper 2 and paper 3), the interplay with motivation (paper 2, paper 4), and systematic profiles (paper 4). The presented research was conducted in controlled settings (paper 1, paper 3) as well as in the field (school: paper 2; university: paper 4). In addition to cross-domain implicit theories of intelligence, failure, giftedness and effort, domain-specific implicit theories of self-regulated learning are addressed. Dependent variables were assessed with various methods including self-reports, knowledge tests, and behaviour observation. By addressing aspects of development, individuals and society, the papers in this symposium open a broad perspective on implicit theories and allow for theoretical and practical implications for different educational settings.

Manipulation of implicit theories and effects on parental co-regulation in preschoolers

Presenting Author:Maren Stern, University of Heidelberg, Germany; **Co-Author:**Kim Gärtner, Heidelberg University, Germany; **Co-Author:**Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

The development of self-regulation is seen as an important hallmark in early childhood. While self-regulation skills are still developing, children are dependent on parents' co-regulation. However, little is known about how parental co-regulation is influenced. Therefore, this study explores the role of parent's mindsets about the malleability of children's self-regulation and parent's beliefs on failure shaping parenting behaviour. Based on an experimental design, we induced four different mindsets in 40 parents of preschool children (three to six years of age). These mindsets either implied that self-regulation was a changeable or fixed ability or that failure was something debilitating or enhancing. Parent-child-dyads were then observed working on multiple problem-solving tasks for ten minutes. The parental implicit theories of these domains were successfully manipulated, and differences in performance during problem-solving were found. Further video analysis of parent-child-interaction will show, if parental implicit theories affect certain parenting behaviours.

The role of implicit theories and grit in predicting students' academic motivation and achievement

Presenting Author:Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Francesca Suter, University of Zurich, Switzerland; **Co-Author:**Carmen Hirt, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland

The present study examines the role of students' implicit theories of ability and grit in a challenging real-life school achievement context. 1,215 students from upper-secondary school level with a mean age of 17.5 years were followed over the period of one school year while working on their final thesis. Data was collected at several assessment points. We addressed the following two research questions: (1) How do implicit theories and grit relate to students' achievement goal orientations, and (2) Are there indirect effects from students' implicit theories and grit on students' intrinsic and extrinsic motivation as well as on academic achievement (via achievement goals)? Structural equation modelling revealed that students who endorse an incremental theory of ability show a positive motivational pattern which, in turn, positively influences a student's academic achievement. Furthermore, the results confirm that perseverance of effort (PE) has a stronger criterion validity than consistency of interest. PE is a significant positive predictor of mastery goals, performance-approach goals, and intrinsic motivation. These, in turn, positively affect academic achievement. As expected, we found significant indirect effects of students' implicit theories and grit on academic motivation and academic achievement. The role of implicit theories and grit for students' learning is discussed.

A malleable view of excellence can help attract underrepresented minorities to elite organizations

Presenting Author:Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany; **Presenting Author:**Katharina Kriegbaum, Heidelberg University, Germany; **Co-Author:**Christina Bauer, Freie Universität Berlin, Germany; **Co-Author:**Bettina Hannover, FU Berlin, Germany

Why are stigmatized minorities less likely to apply at selective institutions like the Ivy League or scholarship organizations? We suggest that organizations inadvertently promote implicit theories of excellence, i.e., whether successful applicants' required excellence is fixed and innate or malleable. Messages implying a fixed view of excellence may deter stigmatized minorities and contribute to their underrepresentation. According to achievement-related stereotypes, stigmatized individuals like African ethnic minorities are less gifted than non-stigmatized individuals, implying different narratives about sources of excellence: While non-stigmatized individuals can reach excellence through fixed giftedness, stigmatized individuals can only succeed through effortful training of malleable characteristics. We hypothesized that individuals report a greater fit with and interest in organizations using messages about implicit theories that match these group-based narratives: While non-stigmatized individuals may prefer organizations emphasizing a fixed view on excellence, stigmatized individuals may favor a malleability focus. In our experiment, 229 students rated information material of a selective scholarship organization. While the unaltered original emphasized a fixed view of excellence, the manipulated version focused on malleability. As expected, stigmatized individuals reported increased fit in the malleable condition while non-stigmatized individuals showed higher fit in the fixed condition. Perceived fit in turn predicted individuals' interest to apply at the scholarship organization. Results suggest that emphasizing fixed excellence attracts the stereotypically gifted, while a focus on malleability attracts the intellectually stigmatized. Tailored messages about the malleability of excellence may help recruit underrepresented minorities.

Profiles of implicit theories and their relation to aspects of self-regulated learning

Presenting Author:Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany; **Co-Author:**Katharina Kriegbaum, Heidelberg University, Germany; **Co-**

Author: Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Implicit theories are important belief systems that influence individuals' motivation and behaviour. In academic contexts, mainly domain-general implicit theories of ability (e.g., intelligence) and their relation to self-regulated-learning (SRL) have been examined. It has been shown that domain-specific implicit theories of SRL contribute to the prediction of goal-orientations and application of learning strategies in students. This paper addresses the questions (1) if systematic profiles of domain-general and domain-specific implicit theories can be extracted and (2) if differences in meta-cognitive knowledge on SRL, goal-orientations, and the application of learning strategies can be found for the specific profiles. The sample consisted of $N = 254$ students from a medium-sized university in Germany. Latent profile analyses were conducted and models were compared on the basis of fit indices (AIC, BIC, Entropy). A three-profile solution fitted the data best. Profile 1 "Entity-Theory" showed lower values in the malleability of intelligence and SRL, profile 2 "Undecided" indicated that intelligence and SRL are neither fixed nor malleable. Students in profile 3 "SRL-Malleability-Theory" had the highest scores for malleability and relevance of SRL. Differences in students' goal-orientations and learning strategy application were found depending on the profiles, for example students with an entity-theory profile showed lower meta-cognitive knowledge about SRL ($p < .05$), and higher performance-approach as well as performance-avoidance goal-orientations ($p < .05$). Students with an SRL-malleability-profile showed a higher mastery-goal orientation and applied learning strategies more often compared to both other profiles ($p < .05$). The results emphasise the importance of investigating domain-specific implicit theories.

Session C 5

12 August 2019 15:30 - 17:00

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Teaching and Teacher Education

The Role of Attitudes and Epistemic Beliefs for Learning and Instruction

Keywords: Attitudes and beliefs, Conceptual change, Educational Psychology, Higher education, Secondary education, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Martin Daumiller, University of Augsburg, Germany

Organiser: Stefan Siegel, University of Augsburg, Germany

Discussant: Robert Kordts-Freudinger, University of St. Gallen, Switzerland

Attitudes and epistemic beliefs play an important role for learning and instruction (e.g., Richardson, 1996; Green & Hood, 2013). Often unconsciously, attitudes and epistemic beliefs can influence the perception and behavior of learners and teachers in all contexts of education (e.g., Eagly & Chaiken, 1993; Mayer & Rosman, 2016). As attitudes and epistemic beliefs are considered important aspects of learning and teaching, research endeavors are currently on the rise. Although there is empirical evidence for relations between attitudes, epistemic beliefs and the quality of learning and instruction, they still are empirically little investigated prerequisites of teacher professionalism and there remain unsolved theoretical and methodological questions. Thus, the aims of this symposium are (a) to share findings of research investigating the role of attitudes and epistemic beliefs for the quality of learning and instruction, and (b) to highlight similarities and differences regarding theoretical conceptualizations of attitudes and epistemic beliefs and methodological approaches used to measure them. The symposium brings together and discusses multiple studies focusing on attitudes and epistemic beliefs of learners and instructors from the fields of secondary and higher education to examine secondary students' attitudes towards heterogeneity (paper 1), how and in what ways attitudes and epistemic beliefs of university students impact learning during conceptual change (paper 2), the interplay of students and lecturers theory-related attitudes and beliefs with important aspects of learning and instruction (paper 3) and the psychometric properties of a new instrument to measure teacher educators' knowledge, beliefs and attitudes toward evidence-based teaching (paper 4).

Attitudes Towards Heterogeneity of Secondary Students

Presenting Author: Stefanie Dotzel, University of Mannheim, Germany; **Co-Author:** Karina Karst, University of Mannheim, Germany

Studies show that students' attitudes towards academic environment and learning do influence students' performance. So far, studies only investigated teachers' attitudes towards heterogeneity and very little is known about students' attitudes. In this study we are therefore developing a questionnaire to measure students' attitudes towards heterogeneity in the subject German using a sample of $N = 290$ fifth- and sixth-graders. The theoretical background is based on the three-component model distinguishing a cognitive, affective and a behavioral component. Results show good reliabilities and acceptable fit measures (RMSEA and CFI) conducted by a confirmatory factor analysis. Correlations show that students with more positive thoughts about heterogeneous classes also report that they'd experience more joy and well-being in heterogeneous classes. Those students were also more likely to choose a heterogeneous class, if they were able to. Mean values reveal that students inherit a general positive attitude towards heterogeneity measured by the cognitive and affective dimension. However, this result cannot be found for the behavioral component, which underlines that, on average, students would prefer a less heterogeneous class. In conclusion we find that attitudes towards heterogeneity already exist for early secondary-school students. Further analyzes will investigate whether those attitudes can predict students' achievement and whether students' perception of their own class heterogeneity is systematically pronounced.

Conditional effects of epistemic beliefs on attitudes, vaccine misconceptions, and conceptual change

Presenting Author: James Vivian, McGill University, Canada; **Co-Author:** Krista Muis, McGill University, Canada

Revising misconceptions (i.e., conceptual change) is vital to supporting more scientific understanding of a topic. Misinformation about complex socioscientific topics such as genetically modified foods, climate change, and vaccines can give rise to misconceptions that have particularly deleterious effects on learning and decision-making behaviors. Learner characteristics such as attitudes and epistemic beliefs play a critical role in the likelihood individuals will revise misconceptions during conceptual change. While attitudes bias the selective processing of information during learning, epistemic beliefs serve as a filter through which attitudinally relevant information is interpreted and evaluated. Together, attitudes and epistemic beliefs reciprocally influence one another and impact how individuals select, perceive, interpret, and evaluate complex socioscientific information during conceptual change. Participants ($N = 76$) completed self-report measures to assess their prior knowledge, attitudes, and epistemic beliefs prior to reading either a refutation or expository text. Following reading, participants completed a knowledge post-test to assess conceptual change. Findings from a moderated mediation analysis revealed statistically detectable conditional indirect effects of prior misconceptions on post-test conceptual change via learners' attitudes towards vaccines that varied as a function of their epistemic beliefs. Specifically, learners with more constructivist epistemic beliefs regarding the complexity, certainty, source, and justification of vaccines knowledge tended to self-report more positive attitudes towards vaccines, and in turn, revised more misconceptions at post-test than learners who expressed less constructivist epistemic beliefs and more negative attitudes towards vaccines. Educational implications and directions for future research are discussed.

Theory-related Attitudes and Beliefs of Students and Lecturers: Results of a Mixed-Methods-Study

Presenting Author: Stefan Siegel, University of Augsburg, Germany; **Co-Author:** Martin Daumiller, University of Augsburg, Germany

Learning about and teaching educational theories is an important element of educational studies and teacher training. Without thorough theoretical knowledge, competencies and, in particular, adequate theory-related attitudes and beliefs, learners and educators do not only act in an unprofessional manner but also forego a variety of learning and development opportunities. Although not yet systematically researched, it can be assumed that students' and lecturers' attitudes and epistemic beliefs about educational theories are relevant prerequisites for high quality learning and instructional processes. The aim of this study was to explore the attitudes and beliefs of university students as well as lecturers concerning educational theories, and to investigate their interrelations with important aspects of learning and instruction such as achievement motivations and academic emotions. To this end, a multi-perspective mixed-methods-study was conducted. Therefore, interviews with 32 students and 12 lecturers were conducted and analyzed by means of qualitative content analysis. In addition, the interviewees completed questionnaires on learning motivations, emotions, and other aspects of learning and instruction. The results indicate that the students' and lecturers' attitudes and beliefs about educational theories are different constructs. Furthermore, the importance of educational theories for learning and

instruction were evaluated divergently, and differentially adaptive motivations and emotions were expressed depending on different theory-related attitudes and beliefs of the interviewees. Taken together, the results point to the importance of these constructs for learning and instruction as disentangling their interrelations with achievement motivations and academic emotions could help to better describe, explain and foster their individual professionalization.

The Evidence-Based Teaching Knowledge, Beliefs and Attitudes Scale

Presenting Author: Despoina Georgiou, Ludwig Maximilian University, Germany; **Co-Author:** Sog Yee Mok, University of Zurich, Switzerland; **Co-Author:** Anne Wiesbeck, TUM School of Education, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany

The aim of this study is to report the development and usability of an instrument that measures teacher educators' knowledge, beliefs, and attitudes towards Evidence-based teaching (EBT) practices. Research on evidence-based practices (EBP) in medicine has shown the significance of several personal domain variables (Clarke & Hollingsworth, 2002) such as practitioners' knowledge, beliefs, and attitudes toward the implementation of EBP. In education, the investigation of the aforementioned variables has received little attention within the literature and research. Based on existing instruments from the medical field, we developed three scales that assess teacher educators' knowledge, beliefs, and attitudes towards EBT. Initially, we collected 193 items from six EBP questionnaires. After expert feedback validation and piloting, 47 items were selected for the final instrument. Teacher educators ($N = 208$) from all over Germany, Switzerland and Austria completed the 47 item EBT scale. An exploratory factor analysis (EFA) was conducted to reduce the number of items and to test the factor structure of the newly developed scale. A review of eigenvalues, a visual scree test, an inspection of the residual correlation matrix, and a parallel analysis were conducted. Factor loadings ranged from .40 to .74. Taken together, the indicators support the expected three-factorial solution. This study provides initial evidence to support the reliability and validity of the EBT scale in teacher education and in particular in a heterogeneous sample of teacher educators. Moreover, the study sheds light on the distinction between knowledge, beliefs and attitudes and provides evidence on their individual nature.

Session C 6

12 August 2019 15:30 - 17:00

Lecture Hall - H11

Symposium

Motivational, Social and Affective Processes

Teacher wellbeing: what does it mean and how can it be supported?

Keywords: E-learning/ Online learning, Educational Psychology, Emotion and affect, In-service teacher education, Motivation and emotion, Pre-service teacher education, Primary education, Qualitative methods, Quantitative methods, Self-efficacy, Teacher Effectiveness, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Susan Beltman, Curtin University, Australia

Discussant: Carmela Aprea, University of Mannheim, Germany

Concerns regarding stress, burnout and attrition of teachers and educational leaders, have led to a focus on understanding what helps teachers to remain in the profession as committed, quality practitioners. The need to develop and support such professionals is seen as crucial, but complex and multidimensional terms such as resilience and wellbeing are challenging to conceptualise and investigate. This symposium examines what is known about teacher wellbeing as well as presenting empirical findings from interventions designed to support teacher wellbeing and resilience. Paper 1, from Switzerland, sets the scene for the symposium by providing a comprehensive, systematic review of literature related to teacher wellbeing, including, for example, its conceptualisation, operationalisation, research methods and interventions. The remaining three papers present empirical findings related to interventions. Paper 2, from Canada, reports on a mindfulness intervention designed to enhance the wellbeing, resilience and self-efficacy of preservice teachers. Paper 3, from Australia, uses a lens of self-efficacy to understand the impact, for a group of students during their final school placement, of engaging with online modules designed to develop preservice teachers' capacity for resilience. Finally, Paper 4 focuses on in-service teachers in Portugal who participated in workshops designed to build their wellbeing and resilience. Multiple quantitative measures examined a variety of variables related to these constructs. Together the papers indicate the complexity of concepts such as wellbeing, examples of interventions designed to support teachers, and the importance of these for teachers across different points in their careers.

A systematic review of the research literature on teacher well-being

Presenting Author: Tina Hascher, University of Bern, Switzerland; **Co-Author:** Jennifer Waber, University of Bern, Switzerland

Teacher well-being (TWB) is a crucial issue for school and society and the rationale that teachers who feel well in school are good teachers has entered the scientific discourse (e.g., Branand & Nakamura, 2017). However, the growing emphasis on TWB and its affinity to other psychological constructs also has led to a lack of clarity of the research field (e.g., Bricheno, Brown, and Lubansky, 2009). Our systematic review followed the PRISMA-statement (Moher et al., 2009) and aimed at describing, appraising and synthesizing the empirical research base on TWB between 2010-2018 in order to find answers to the following questions: 1. How is TWB conceptualized and what are core elements of TWB? 2. How is TWB operationalized and investigated? 3. What is known about the prevalence of TWB? 4. What are predictors and consequences of TWB? 5. How can TWB be fostered? ERIC, Scopus, Psycinfo, Science Direct, Taylor & Francis and Sage Journals served as electronic data bases ($N = 608$) and it becomes evident that the minority of studies ($N = 145$) investigated TWB as a well-defined multi-component construct or addressed several components. Within the existing array of instrument that investigate TWB instruments are seldomly related to each other. Representative as well as longitudinal studies are scarce. Generally, TWB is at risk due to the high burden to the teaching profession resulting in reduced teacher engagement, teaching quality, and educational outcomes. Approaches from positive psychology such as mindfulness serve as a major source for TWB interventions.

On the path of mindfulness with Quebec student teachers

Presenting Author: Mylene Leroux, Université du Québec en Outaouais (UQO), Canada; **Co-Author:** Nancy Goyette, Université du Québec à Trois-Rivières, Canada; **Co-Author:** Catherine Malboeuf-Hurtubise, Bishop's University, Canada

As more and more researchers highlight the importance of a certain form of psychological training in teacher education (Théorêt & Leroux, 2014), among others to better prepare to teacher induction (Pelletier & Marzouk, 2018), mindfulness-based interventions seem to be a relevant option. Positive impacts (reduced stress and anxiety, increase in wellbeing, etc.) have been documented with university students (Grégoire et al., 2016) and in-service teachers (Hwang et al., 2017), but very few studies have been conducted with student teachers, even if some of them report high levels of stress and psychological distress (Caires et al., 2012; Gardner, 2010), especially during their last student teaching (Eksi et al., 2016). Throughout the 2018 fall semester, we proceeded to a preliminary experiment of 30-minutes mindfulness workshops with student teachers in parallel to their last student teaching. Discussions and exchanges with each group allowed to identify their first impressions, awareness, emotions, and possible reinvestments in their own practice/life or with their pupils. Further analyses and investigation will allow for the identification of outcomes on the development of their emotional competence and eventually on their wellbeing, resilience and self-efficacy.

Fostering school teachers' resilience and wellbeing through professional learning

Presenting Author: José Castro Silva, ISPA-Instituto Universitário, Portugal; **Co-Author:** Luisa Fernandes, ISPA - Instituto Universitário/CIE-ISPA, Portugal; **Co-Author:** Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:** Maria João Gouveia, ISPA – Instituto Universitário, Portugal

From a social ecological view, resilience can be understood as a dynamic process where individual characteristics and contextual factors interact over time. Resilience can be fostered amongst teachers in order to sustain their wellbeing and commitment to quality education. This study examined the effects of a training program focused on resilience and well-being, targeting in-service Portuguese teachers. This paper reports a study using a quasi-experimental design involving 94 teachers (35 in the experimental and 59 in the control group), mainly working in middle and secondary education. The effects of the professional

learning program were assessed using the following measures: Motivation, Global Resilience, Commitment to the Profession, Self-Efficacy, Social Context, School Support, Positive and Negative Experiences (SPANE), Work Well-being (UWES), and Work Meaning. The experimental group participated in an 18 hour professional learning program, with 9 two hour sessions once a week. Repeated measures MANOVAs and ANOVAs showed the effects of the professional learning program over all the variables, with the exception of Teacher Commitment to the Profession. These findings contribute to the growing body of research conceptualising teacher resilience as a multidimensional construct. This study has implications for teacher professional learning, enabling teachers to be empowered by this program.

“I actually felt more confident”: Using online modules to develop preservice teacher self-efficacy.

Presenting Author:Caroline Mansfield, University of Notre Dame Australia, Australia; **Co-Author:**Susan Beltman, Curtin University, Australia

Although it is acknowledged that non-cognitive capabilities, such as resilience are important for teachers, these are often neglected in mandated teacher education program requirements and teaching standards. Yet with concerns regarding wellbeing of teachers at all levels of experience, developing capacities for resilience is crucial professional learning. One personal capacity important for resilience is self-efficacy. The aim of the research is to understand how engagement with online modules designed to build resilience capacity of preservice teachers (www.BRiTE.edu.au) influences efficacy for teaching during the often challenging time of professional experience in schools. Prospective primary and secondary teachers (N=27) enrolled in a one year program based at two Australian regional university campuses completed both the five online modules and final six week professional experience placement. In-depth interviews were conducted following the placement, focusing on perceptions of the modules and their influence during their placement and future teaching. Transcribed recordings were analysed in relation to various aspects of self-efficacy such as mastery experiences, vicarious experiences, social persuasion and emotional arousal. Both the design and content of the modules contained elements that aligned with the components of self-efficacy as well as increasing overall efficacy e.g. *“I did feel more confident and a bit calm.... The modules helped me to think... to be proactive and actually be proactive in a positive sense”* The findings are discussed in relation to the mechanism by which an online professional learning tool can assist future teachers to build their capacity for coping and resilience.

Session C 7

12 August 2019 15:30 - 17:00

Lecture Hall - H08

Single Paper

Instructional Design

Comprehension of Text and Graphics

Keywords: Comprehension of text and graphics, Conversation/ Discourse analysis, Environmental education, Higher education, Informal learning, Language (Foreign and second), Mathematics, Qualitative methods, Quantitative methods, Secondary education, Teaching/instruction, Writing/Literacy

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Miriam Gruening, Otto-Friedrich-Universität Bamberg, Germany

OER accessibility and the effect of simplification on text processing among English learners

Keywords: Informal learning, Language (Foreign and second), Qualitative methods, Teaching/instruction

Presenting Author:Irina Rets, Open University, United Kingdom; **Co-Author:**Ursula Stickler, The Open University, United Kingdom, United Kingdom; **Co-Author:**Tim Coughlan, The Open University, United Kingdom, United Kingdom; **Co-Author:**Luisa Astruc, The Open University, United Kingdom, United Kingdom

In English Medium of Instruction (EMI) settings English learners are expected to process reading materials that are commonly written for English native speakers. However, a lack of English proficiency is reported to be the major difficulty with EMI (Chapple, 2015). While English learners can receive scaffolding in formal education, which may ease their processing, they often have little support in non-formal educational settings, such as when following Open Educational Courses (OER) online. One approach suggested in EMI literature on how to overcome these difficulties is to provide English learners with alternative simplified versions of the reading materials (Galloway et al., 2017). This suggestion of text simplification can be supported by the assumptions of cognitive load theory (Sweller et al., 2011). However, there is lack of empirical evidence on the extent to which OER materials are accessible to English learners and the effect of simplification on English learners' text processing. In this study, we conducted readability analysis of the OER materials from a leading OER platform and linked the results of this analysis with the analysis of the eye-tracking experiments and stimulated recall interviews which shed light on English learners' psychological experiences of reading authentic and simplified OER texts. Our findings, which we will present at EARLI 2019, indicated that authentic English OER texts selected from an online courseware require advanced language proficiency. Our results also provided evidence in support of text simplification as a strategy of material modification for English learners.

Human vis-a-vis Nature: Analytical perspective implicated in Chinese ESL textbooks

Keywords: Conversation/ Discourse analysis, Environmental education, Language (Foreign and second), Secondary education

Presenting Author:Ka Lok Cheng, The University of Hong Kong, Hong Kong

The current study attempts to identify the environmental viewpoints embedded in the reading passages within the ESL textbooks used by senior secondary school students in the People's Republic of China to permit the shaping of students' ideas of human-environment relationship in the ESL classrooms to be exposed. Systemic linguistic analysis was carried out on 20 environmentally-themed continuous text blocks. The clauses in these text blocks were assessed and clustered on the basis of their ideational, interpersonal and textual meta-functions. These clusters were then interpreted through the lens of the analytic-synthetic dimension of Pepperman world hypotheses. An analytical worldview can be implied from the text blocks studied, and the world is presented as fully reducible into human and nature. The fine-grained analysis of the transitivity of the sample clauses revealed that material process clauses predominate and most of these clauses involve humans as actors and “the environment” in its abstract sense is the most common non-actor participant. Moreover, the causal-relationships portrayed in the examined textbooks are mostly as linear event sequences with one-to-one causal-effect correspondence. The analysis of the progression of the topical themes showed that “constant progression pattern” is almost non-existent in the causal-effect text blocks, which indicates the virtual absence of the portrayal of the one-to-many causal-relationships among species. The current study bears with the potential of stimulating further analyses of the environmental viewpoints hidden within the instructional materials and thus the formulation of pedagogical strategies for countering mainstream environmental discourses.

Learning from texts and mind maps: an eye-tracking and retrospective interview study

Keywords: Qualitative methods, Quantitative methods, Teaching/instruction, Writing/Literacy

Presenting Author:Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Rielke Bogaert, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Leen Catrysse, University of Antwerp, Belgium

The ability to process and learn informative text is of vital importance for future success. Prior research however points at late elementary graders' lack of necessary strategies to learn from texts and the promising role mind maps as colorful spatial text arrangements might play in supporting text-based learning. However, research also point at additionally needed sophisticated strategies to take advantage of these spatial text arrangements. The current study investigates (a) the cognitive processes students apply when learning from texts and mind maps, (b) whether the presentation of mind maps presented either beforehand or afterwards primes different cognitive processes and (c) the relationship between text and mind map learning and knowledge acquisition. An eye-tracking study followed by a multilayered posttest and a retrospective interview was conducted. Sixty-four elementary school students were randomly assigned to a text (T)-condition, mind map-text (MM-T) condition, or text-mind map (T-MM) condition. Logtransformed eye-tracking data and posttest data were analyzed using ANOVA and independent t-tests. Interviews were qualitatively coded and descriptively analyzed. Results indicate that, regardless the condition, students mainly engaged in superficial, initial processing-level strategies when learning text. In the MM conditions, students engaged more in deeper-level strategies.

Furthermore, significant differences were found in free recall, favoring students in the T-MM condition. Interview data corroborate that these students refer more to their advantageous structure and design for recall. The current study advocates the didactical use of mind maps presented after text reading and learning. Further data analyses will be conducted to investigate these results in-depth.

Errors in Bayesian situations

Keywords: Comprehension of text and graphics, Higher education, Mathematics, Teaching/instruction

Presenting Author: Andreas Eichler, University of Kassel, Germany; **Co-Author:** Katharina Böcherer-Linder, Institute for Mathematics, Germany; **Co-Author:** Markus Vogel, University of Education Heidelberg, Germany

It is an ongoing question, which visualisation effectively increases people's performance in Bayesian reasoning tasks and which properties of a visualisation are responsible for an increased performance. In this paper, we compare the effectiveness of five visualisations, i.e. the tree diagram, the double tree diagram, the 2x2-table, the unit square and an icon array. We conducted one experiment with a randomised sample of about 280 university students. The students were assigned to five conditions, i.e. the tree diagram, the double tree, the 2x2-table, the unit square and the icon array. In this experiment the students had to compute fractions according to Bayes formula in four Bayesian situations. We compared the results referring to the numerators and denominators the students used in their solution and, finally, the errors that the students made. Actually, the tree diagram and, partially, the double tree diagram were outperformed by the other three visualizations of the 2x2-table, the unit square and the icon array. The results could inform the debate referring to Bayesian reasoning concerning identifying and explaining visualisations' efficiency.

Session C 8

12 August 2019 15:30 - 17:00

Seminar Room - S06

Single Paper

Instructional Design, Learning and Instructional Technology

Comprehension of Text and Graphics and Multimedia Learning

Keywords: Assessment methods and tools, Comprehension of text and graphics, Computer-assisted learning, Design based research, Educational Psychology, Experimental studies, Instructional design, Multimedia learning, Social sciences

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Sigal Eden, Bar-Ilan University, Israel

Multimedia Effects of Representational Pictures in Testing: Does the Response Format Matter?

Keywords: Assessment methods and tools, Comprehension of text and graphics, Instructional design, Multimedia learning

Presenting Author: Marlit Annalena Lindner, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Johannes Schult, Landesinstitut für Schulentwicklung, Germany

Adding representational pictures to multiple choice questions (MCQ) has beneficial effects on students' item solving performance. So far, it is unknown whether this effect is transferrable to test items in which students have to construct an answer on their own (i.e., constructed response questions; CRQ). The current experiment with $N = 575$ fifth- and sixth-graders applied a within-subject design with a full permutation of conditions to investigate the effect of representational pictures (i.e., text-only [TO] vs. text-picture [TP]) in different response formats (MCQ vs. CRQ). Each student answered four blocks à 7 test items (28 in total) under the 2x2 design conditions (i.e., MCQ-TO; MCQ-TP; CRQ-TO; CRQ-TP). While we did not expect a meaningful interaction of the factors *response format* and *multimedia*, we expected to find significant main effects on students' performance in a science test (i.e., MCQ > CRQ; text-picture > text-only). Our hypotheses were (mostly) confirmed. Yet, we found a very small but significant interaction, indicating that pictures seemed to be slightly more beneficial for students' performance in CRQ compared to MCQ; however, the interaction seems to be of subordinate practical relevance. The overall pattern of results suggests that item format and use of representational pictures could be relevant to deliberately influence item difficulty by design.

Learning with Dynamic and Static Visualizations: Influence of Observing Hands and Spatial Ability

Keywords: Comprehension of text and graphics, Computer-assisted learning, Instructional design, Multimedia learning

Presenting Author: Birgit Brucker, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:** Nadine Marcus, University of New South Wales, Australia;

Co-Author: Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:** Ann-Christine Ehlis, University Hospital Tübingen, Germany; **Co-**

Author: Paul Ayres, University of New South Wales, Australia; **Co-Author:** Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM), Germany

This study investigates whether observing hand actions in dynamic and static visualizations is helpful for learning hand-manipulative tasks in terms of knot tying. Functional near-infrared spectroscopy (fNIRS) was used to address whether dynamic visualizations or/and observing hands in the visualizations activate the human mirror-neuron-system and whether its activation mediates the facilitation of learning. During learning to tie two knots (Trucker's Hitch and Bowline) participants viewed either dynamic or static visualizations with or without hands (2x2-between-subjects-design). Moreover, learners' spatial ability was measured as a potential moderator during learning with different types of visualizations. Participants performed a motor skills task (knot tying performance) and a cognitive task (reasoning about the knot tying process). Results differed in dependence of the task, the to-be-tied knot, and learners' spatial ability. Higher-spatial-ability learners showed better motor skill performance from viewing dynamic visualizations (Bowline knot) and visualizations with hands (Trucker's Hitch knot). Lower-spatial-ability learners showed lower cognitive task performance from viewing the dynamic visualizations (Bowline knot) and visualizations with hands (Trucker's Hitch and Bowline knot). The fNIRS data are currently analyzed. In sum, the effectiveness of different types of visualizations in terms of their dynamism (dynamic or static) and hand visibility (with or without) depends on the to-be-tied knot, the to-be-accomplished task (motor skills performance vs. cognitive reasoning) as well as spatial ability. Whereas higher-spatial-ability learners acquire better motor skills from learning with dynamic visualizations and observing hands in visualizations, lower-spatial-ability learners suffer from the same instructional formats on cognitive reasoning tasks.

Presenting a Visualization Holistically versus Sequentially - Does It Make any Difference?

Keywords: Comprehension of text and graphics, Design based research, Multimedia learning, Social sciences

Presenting Author: Mandy Steinbach, University of Education Freiburg, Germany; **Co-Author:** Josef Nerb, Department of Psychology, Freiburg University of Education, Germany; **Co-Author:** Anika Dreher, Department of Mathematics, Freiburg University of Education, Germany; **Co-Author:** Alexander Eitel, University of Freiburg, Germany

Learning from text with visualisations is common teaching practice and its benefit when adhering to certain principles is beyond question. In particular Social Sciences follow a long tradition of applying different forms of visual contents. Nonetheless, their quality features and the way they should be presented are rather unexplored. We figured out that a lot of visualisations (especially in schoolbooks) apart from being redundant are cluttered with details which may produce cognitive overload. The aim of the project is to identify the most effective presentation style of a single (static) visualisation that scales down cognitive load and hence fosters comprehension of complex contents. One way of doing so is the comparison of a holistic versus a sequential presentation style in combination with using signaling techniques as an additional support. Therefore, a computer-based experiment with four different groups (holistic vs. sequential; with vs. without signaling) will be performed with pupils in Social Sciences. From a theoretical perspective reasons for an advantage of either version can be found: the sequential format stronger directs pupils' attention processes (scaffolding technique) and reduces cognitive load; the holistic format promotes self-regulated learning processes and understanding through self-directed recognition, organizing and processing of a visualisation.

"Hands-on, mind off": Can demonstration further improve learning from a novel animation design?

Keywords: Comprehension of text and graphics, Computer-assisted learning, Educational Psychology, Experimental studies

Presenting Author: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:** Richard Lowe, Curtin University, Australia; **Co-Author:** Marie Lefils, University of Dijon, LEAD-CNRS, France; **Co-Author:** Marine Léveillé, University of Dijon, LEAD-CNRS, France

This study investigates the potential benefit on learning from dynamic visualizations of combining the composition approach of animation design (which uses a progressive, sequential staging of dynamic information to present events in a more assimilable way) with two different ancillary learning activities to increase mental model quality scores: a manual demonstration using a plastic replica of the animated content, vs. a verbal explanation of what was shown in the animation. Students ($N = 116$) were randomly assigned to six groups in a 3x2 experimental design with two factors: 'Design' and 'Learning Activity'. Regarding Design three different animations of an upright piano mechanism were created. A control condition using a comprehensive animation presentation was compared to a *contiguous* condition following the causal chain, and to a *non-contiguous* condition, showing a quasi-random sequence. For Learning Activity, in the manual demonstration, participants had to show the events seen on screen with replicas and in the verbalization condition, participants had to describe the events. Demonstrations were performed on a glass-topped table, videoed from beneath, and verbal productions recorded. Participants were eye tracked. Four comprehension post-tests were used including a local dynamics task, a written account of the piano operation, a demonstration of the piano's full operation (replica) without verbalization and a demonstration with a verbal explanation. Results showed the superiority of the compositional contiguous condition. Verbalization during learning had a positive effect on learning from the contiguous animation, whereas demonstration tended to weaken the potential benefits offered by this type of design.

Session C 9

12 August 2019 15:30 - 17:00

Lecture Hall - H05

Single Paper

Learning and Social Interaction, Lifelong Learning

Quantitative Methods and Workplace Learning

Keywords: Collaborative Learning, Competencies, Experimental studies, Higher education, Lifelong learning, Mixed-method research, Psychometrics, Quantitative methods, Self-efficacy, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Hermann J. Abs, University of Duisburg-Essen, Germany

A short measurement for professional agency in work organisations

Keywords: Lifelong learning, Psychometrics, Quantitative methods, Workplace learning

Presenting Author:Eija Räikkönen, University of Jyväskylä, Finland; **Co-Author:**Katja Vähäsantanen, University of Jyväskylä, Finland; **Co-Author:**Susanna Paloniemi, University of Jyväskylä, Finland; **Co-Author:**Päivi Hökkä, University of Jyväskylä, Finland

Although there is increasing research on professional agency and its importance for organisational development and professionals' learning (Goller & Paloniemi, 2017), this topic remains underexplored via quantitative instruments in working life (for exceptions, see Goller, 2017; Vähäsantanen et al., 2018). The latter of the aforementioned studies introduced professional agency measurement (PAM) for investigating three dimensions of professional agency: influencing at work, developing work practices, and negotiating professional identity. The research further suggested the need to explore the functionality of some items in different contexts and validate the structure relative to other relevant phenomena with validated measurements. Primarily, this study was aimed at shortening the original PAM and exploring its usability for cross-validating datasets and the relationship between professional agency and work engagement (Schaufeli et al., 2017). Datasets ($N = 449$) from the healthcare, real estate, and information technology (IT) fields were analysed via confirmatory factor analysis. Consequently, three dimensions of professional agency, with three items per dimension, emerged. All dimensions showed good internal consistency (range 0.78–0.80) and high correlations with their original, longer counterparts (range 0.91–0.95). Overall, the short version of PAM is more functional than the longer version. The three shortened professional agency dimensions appeared to be separate, but closely linked to work engagement. Finally, on average, IT personnel reported more possibilities to influence at work and negotiate professional identity than healthcare and real estate personnel. This new measurement benefits scholars and practitioners who are interested in researching and fostering professional agency in work organisations.

Teaming under Uncertainty - Reflexivity and Psychological Safety for Information Sharing

Keywords: Collaborative Learning, Experimental studies, Quantitative methods, Workplace learning

Presenting Author:Therese Grohnert, Maastricht University, Netherlands; **Co-Author:**Roger Meuwissen, Maastricht University, Netherlands; **Co-Author:**Wim Gijsselaers, Maastricht University, Netherlands

How can teaming, defined as teamwork on the fly, be fostered under conditions of uncertainty? In this experimental study with 104 ad-hoc teams, we explore two questions. First, how do differences in task uncertainty affect knowledge sharing across hierarchical levels? Second, can psychological safety and team reflexivity foster information sharing even in a teaming task with high uncertainty? Our experiment consists of a 2×2 design in which we manipulate the degree of task uncertainty (high vs. low), and where we intervene on the teaming process (yes vs. no). Comparing teaming across these four conditions, we find that psychological safety and reflexivity relate positively to information sharing only under conditions of low uncertainty. Under high uncertainty, we did not find a significant relationship. Only those teams that also completed an intervention geared towards facilitating both reflexivity and psychological safety actually affected information sharing in a positive way. These findings illustrate that team learning models can provide more nuanced insights when differentiated by task characteristics, and that under conditions of uncertainty, interventions are important for fostering information search through psychological safety and reflexivity.

Effects of learning culture on transfer results in critical work situations

Keywords: Lifelong learning, Quantitative methods, Self-efficacy, Workplace learning

Presenting Author:Jolanda Botke, Vrije Universiteit Amsterdam, Netherlands

The lack of empirical research on transfer results of soft skills training in mission-critical work situations leads to an incomplete view of the transfer process and makes it difficult for organisations to optimise results from training. This three-wave study examined transfer results in a mission-critical work situations at the Dutch Police. We included motivation to transfer, use of trained skills and individual performance to measure how transfer occurs at different moments after a training. To explore how work conditions influence the transfer effectiveness, we included effects of learning culture on the transfer process. We measured the effect of three dimensions of learning climate: a facilitation learning climate, an appreciation learning climate and an error-avoidance learning climate. Our findings show that, in our critical work situation, motivation to transfer increased the use of skills. However, use of skills has no impact on performance. Structural equation modelling procedures indicate that the impact learning culture differs per transfer stage. A facilitation learning climate was found to be positively related to motivation to transfer and performance. Both an appreciation learning climate and an error-avoidance learning climate were found to be negatively related to performance. The final results allow us to draw up proposals to improve the effectiveness of the post-training transfer process in mission-critical work situations.

Digital competencies: A review of the literature and applications at the workplace

Keywords: Competencies, Higher education, Mixed-method research, Workplace learning

Presenting Author:Maren Oberländer, University of Würzburg, Germany; **Co-Author:**Andrea Beinicke, Würzburg University, Germany; **Co-Author:**Tanja Bipp, University of Würzburg, Germany

In today's organizations and politics, there is a growing awareness of the gap between existing and needed digital competencies of the workforce to master the challenges of the digitalized future at work. This research combines qualitative and quantitative methods to provide a framework of digital competencies at the workplace. We conducted an extensive literature review about definitions and frameworks of digital competencies that might be applicable in the work context. Moreover, eleven half-structured interviews based on the critical incidents technique (CIT) were used to gain insights into the view about digital competencies of professionals with expertise in digitalization processes. Researchers with different educational backgrounds clustered the results and agreed on twenty-five dimensions that constitute digital competencies at the workplace, referring to knowledge, skills, and abilities. By creating a coherent framework and definition,

this research aims to lay the foundation for professional learning and development of digital competencies at work.

Session C 10

12 August 2019 15:30 - 17:00

Seminar Room - S01

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Mathematics in Primary Education

Keywords: Achievement, Cognitive development, Developmental processes, Mathematics, Primary education, Problem solving, Qualitative methods, Quantitative methods, Teacher Effectiveness

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Stephan Vogel, University of Graz, Austria

Predictive power of first graders' characteristics for mathematics achievement 5 years later

Keywords: Developmental processes, Mathematics, Primary education, Quantitative methods

Presenting Author: Kirsten Winkler, University of Mainz, Germany; **Co-Author:** Kristina Mueller, University of Mainz, Germany; **Co-Author:** Daniel Schunk, University of Mainz, Germany

There is a growing body of literature on the predictors of school achievement. However, there are some major shortcomings. First, the time span between measurement of characteristics and predicted achievement is often quite short, second, most studies have a quite narrow selection of predictors and, third, the results are hardly comparable across studies. The current paper examines the predictive power of a large number of first graders' characteristics and skills on their mathematics achievement five years later. We compare the extent to which their personality, their working memory capacity and their prior knowledge in mathematics predict later math achievement beyond fluid intelligence and socioeconomic status. More specifically, we perform regressions accounting for school fixed effects and for the clustered structure of our data, and we investigate to what extent the different predictors from grade 1 explain variance in mathematics achievement of the same 212 students in grade 6. Beyond fluid intelligence and further control measures (which already sum up to 44% of overall variance) (1) the students' personality, is able to explain an additional 10 % of the overall variance, (2) working memory capacity explains an additional 5%, and (3) the students' prior mathematics knowledge explains an additional 13% of overall variance in mathematics achievement 5 years later. Dominance analysis confirms and refines these results and the big effect of prior knowledge remains significant even when controlling for working memory and personality. Our findings emphasize the importance of early learning and education on later mathematics achievement.

Teacher competence as a predictor of student achievement - Differential effects on students

Keywords: Achievement, Mathematics, Primary education, Teacher Effectiveness

Presenting Author: Simone Dunekacke, Freie Universität Berlin, Germany; **Co-Author:** Francesca Muntoni, University of Hamburg, Germany; **Co-Author:** Jan Retelsdorf, University of Hamburg, Germany; **Co-Author:** Aiso Heinze, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Only few studies investigated the relationship between teacher competence and primary school mathematics achievement. The present study examines the relationship between two performance-orientated components of teacher competence and the development of primary school mathematics achievement in Grade 2. The two competence components are Reflective Competence (RC) including abilities to master pre- and post-instructional tasks and Action-Related Competence (AC) including abilities to master performance-related tasks within instruction. Data was analyzed with multilevel analysis for the whole sample of 697 students and linear regression controlling for the nested data structure with "type is complex" option for the sub-samples of low- and high-achieving students. We found no effects of RC and AC on student mathematics achievement in general. However, we found a significant positive effect of RC on low-achieving students' achievement and a significant positive effect of AC on high achieving students achievement. Aspects of teacher training in Germany as well as aspects of the content validity of the test are discussed as possible reasons for the findings.

Children's shifts of attention in phases of stable performance in arithmetic tasks

Keywords: Mathematics, Primary education, Problem solving, Qualitative methods

Presenting Author: Chronoula Voutsina, University of Southampton, United Kingdom; **Co-Author:** Lois George, The University of the West Indies, Jamaica; **Co-Author:** Keith Jones, University of Southampton, United Kingdom

This paper presents an analysis of data from two qualitative microgenetic studies that aimed at examining changes in the verbal reports of 5-6 year old children solving an additive task and 9-10 year old children solving partitive quotient problems. In each of the two studies, children participated in a sequence of task-based interviews. The analysis presented here focuses on phases during which children's approach in solving the tasks remained stable. Children's verbal reports in these phases were analysed through the lens of the theory of shifts of attention. The analysis revealed changes in how individual children communicated and conceptualised the same solving approach over a number of sessions. We propose that these changes appear to be accounted for by shifts related to the *object* and *structure* of children's explicit attention; that is, *what* children attend to and *how*, when reporting on their solving approach. The findings suggest that seemingly unchanged performance can be viewed as a 'dynamic' notion that can be underlain by processes of change in how children attend to relationships between elements of the same task and the same approach in an interactive context. On the basis of our findings, we suggest that it is essential that educators are aware of, and sensitive to, subtle changes that may occur in learners' shifts of attention, even when task performance appears to be unchanged.

A tale of two fraction sub-constructs: The part-whole and quotient

Keywords: Cognitive development, Mathematics, Primary education, Qualitative methods

Presenting Author: Lois George, University of the West Indies, Mona Campus, Jamaica

It is widely recognised that children find the learning of fractions difficult. One of the reasons for this is that fractions is a multi-faceted construct. The part-whole sub-construct of fractions is one of five fraction sub-constructs and is typically the first that children encounter at primary school. Previous empirical research have presented mixed findings as to the effect of the part-whole sub-construct on the learning of other fraction sub-constructs. This presentation reports findings from an investigation into how a sample of Year 5 children (aged nine to ten years), who have only been taught the part-whole sub-construct of fractions, finds the fraction associated with solving partitive quotient problems in a sequence of problem-solving sessions. A qualitative, microgenetic design which employed individual task-based interviews for data collection was used for this research. The data analysis revealed that the research participants used four strategies for finding the fraction, but two strategies were used predominantly. One of the two most commonly used strategies appeared to resemble the conceptualisation for the part-whole relation. Additionally, this research paints a nuanced portrait of how the partitive quotient sub-construct knowledge emerges alongside the existing part-whole knowledge in that children's development of the partitive quotient occurred along several pathways. Some implications of the findings for teaching and learning of fractions at the primary school level of education also form part of the presentation.

Session C 11

12 August 2019 15:30 - 17:00

Seminar Room - S02

Single Paper

Learning and Social Interaction

Social Interaction in Early Childhood Education

Keywords: Attitudes and beliefs, Developmental processes, Early childhood education, Language (Foreign and second), Multicultural education, Peer

interaction, Quantitative methods, Social development, Social interaction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Percival Matthews, United States

Children's epistemic beliefs and their justifications for including others: A longitudinal study

Keywords: Attitudes and beliefs, Developmental processes, Early childhood education, Social interaction

Presenting Author: Susan Walker, Queensland University of Technology, Australia; **Presenting Author:** Jo Lunn Brownlee, Queensland University of Technology, Australia; **Co-Author:** Laura Scholes, Queensland University of Technology (QUT), Australia; **Co-Author:** Eva Marianne Johansson, University of Stavanger, Faculty of Arts and Education, Norway

In this longitudinal study, we explored children's reasoning about social inclusion/ exclusion over three years ($n=169$ Year 1, $n=156$ Year 2, $n=129$ Year 3) of early primary education in Australia and how this reasoning related to changes in epistemic cognition. The data collection involved 30-minute interviews in which children were asked to engage in two tasks related to epistemic cognition and including an aggressive child in their play respectively. Findings showed that children were more likely to choose to include the aggressive child in Year 3 if they also expressed subjectivist epistemic beliefs than if they expressed objectivist beliefs. These children who expressed subjectivist epistemic beliefs were more likely to justify their decision to include the aggressive child based on empathy and fairness, suggesting an increased complexity in their reasoning about inclusion.

A Friend's Presence in Daycare Promote Toddlers' Prosocial Behavior Toward Peers

Keywords: Developmental processes, Early childhood education, Peer interaction, Social development

Presenting Author: Esther Adi-Japha, Bar-Ilan University, Israel; **Co-Author:** Cilly Shohet, Bar Ilan University, Israel

The current study examined the effect of a friend's presence on toddlers' behavior in high child:staff ratio daycare settings. Toddlers ($N = 38$) were video-observed in the presence or absence of a verified friend in two situations that burden staff: morning separation and lunchtime (overall, 152 video-observations). Higher levels of positive social engagement, fewer agonistic behaviors toward peers, and fewer occurrences of distress were observed in the friend's presence. The duration of morning separations decreased by half, toddlers contacted the caregiver less during separations and exhibited more prosocial behaviors. Overall, toddlers demonstrated greater empathic concern when their friend was present. During lunchtime, they also displayed greater concern toward peers other than their friend. Friendships, even at a very young age, can comprise a meaningful emotional resource for soothing and security.

Mother's Interaction Behavior: Profiles, Predictors, and Competence Development of Children

Keywords: Developmental processes, Early childhood education, Quantitative methods, Social interaction

Presenting Author: Gwendolin Blossfeld, University of Bamberg, Germany; **Co-Author:** Manja Attig, Leibniz Institute for Educational Trajectories (LifBi), Germany; **Co-Author:** Sabine Weinert, University of Bamberg, Germany

This study uses a person-oriented approach to examine profiles of mother's interaction behavior, their predictors and their relation to competence development of children. Using data of the first five waves of the infant cohort study of the German National Educational Panel Study (NEPS-SC1; doi:10.5157/NEPS:SC1:5.0.0; $N=595$), we derived profiles from video-based ratings of mother's sensitivity, emotionality, positive regard, and stimulation during semi-structured mother-child interactions collected in the family's home. Based on the four interaction behaviors and following the model fit (calculated with MPlus) we identified for each wave three distinct interaction profiles: responsive (proportion of mothers in this profile by wave: W1: 28%, W2: 37%, W3: 48%), average (W1: 50%, W2: 45%, W3: 42%), and less responsive (W1: 22%, W2: 18%, W3: 10%) mothers. For example, the responsive profile is characterized by a high amount of sensitivity, stimulation, positive regard, and emotionality; the less responsive profile is characterized by a less amount of these four interaction behaviors. With increasing age of the child, we see movements of mothers to the profiles with more responsive interaction behaviors. Further, our preliminary results show that mother's initial profile in wave 1 is predicted by educational level and mother's age at the birth of the child. Mothers with higher education are more likely to conform to a responsive profile compared to less educated mothers.

A Systematic Review on Teacher-Child Interactions with Multilingual and Monolingual Young Children

Keywords: Early childhood education, Language (Foreign and second), Multicultural education, Social interaction

Presenting Author: Annegien Langeloo, University of Groningen, Netherlands; **Co-Author:** Mayra Mascareño, University of Groningen, Netherlands; **Co-Author:** Marjolein Deunk, University of Groningen, Netherlands; **Co-Author:** Nikolai Klitzing, University of Groningen, Netherlands; **Co-Author:** Jan-Willem Strijbos, University of Groningen, Netherlands

Teacher-child interactions are key to effective early childhood education. As multilingual children enter early childhood education with a different linguistic background and show different developmental patterns in diverse academic skills, there is a need for more insight into the interactions between multilingual children and their teachers. This systematic review aims to integrate the results of previous research to gain a better understanding of the nature of the teacher-child interactions that multilingual children are exposed to and how they differ from the teacher-child interactions of monolingual children. Thirty-one studies were included. The included studies (a) mainly focused on multilingual children with low language proficiency in the majority language and (b) did not compare between monolingual and multilingual children. The review shows that teacher-child interactions of multilingual children are to a certain extent comparable to the teacher-child interactions of monolingual children, although teachers adopt different strategies to facilitate the development of multilingual children, such as the use of home language and culture and the use of nonverbal communication to support the teacher-child interactions. Eleven studies also pointed out that multilingual children might be exposed to unequal learning opportunities compared to their monolingual classmates. Teachers used simplified speech and adapted classroom activities to multilingual children.

Session C 12

12 August 2019 15:30 - 17:00

Seminar Room - S03

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Citizenship Education

Keywords: Achievement, Attitudes and beliefs, Case studies, Citizenship education, Mixed-method research, Primary education, Quantitative methods, Secondary education, Student learning, Teacher Effectiveness, Teaching approaches

Interest group: SIG 08 - Motivation and Emotion, SIG 13 - Moral and Democratic Education

Chairperson: Auli Toom, University of Helsinki, Finland

Teaching the Good Citizen? Teacher's Approaches to Education for Democratic Citizenship in Portugal

Keywords: Attitudes and beliefs, Case studies, Citizenship education, Teacher Effectiveness

Presenting Author: Shaima Muhammad, University of Innsbruck, Austria

This study is informed by the need to critically approach the perspectives and experiences of teachers when teaching for citizenship, to provide a 'thick' understanding of teaching for democracy (Carr, 2011), and to foster a critical political approach to citizenship (Westheimer & Kahne, 2004). Inspired by Critical Pedagogy, this study investigates how school teachers in Portugal view good citizenry and teaching for democracy by exploring their preferred aims and practices. The study employs a qualitative methodology to analyse data collected from interviews, document analysis and classroom observation. Initial findings reveal teachers' uncertainty regarding what citizenship means, a tendency to focus on cultivating a personally responsible citizen and an overemphasis on the rational and linear approach to citizenship.

Civic knowledge and expected civic engagement among lower-secondary students

Keywords: Achievement, Citizenship education, Quantitative methods, Secondary education

Presenting Author:Wolfram Schulz, Australian Council for Educational Research (ACER), Australia; **Co-Author:**Julian Fraillon, Australian Council for Educational Research (ACER), Australia

Based on survey data from the latest implementation of the International Civic and Citizenship Education Study (ICCS 2016), this paper explores the associations between students' civic knowledge, their disposition to and involvement in civic engagement within the school context, and their willingness to engage in future civic activities as adults. The multivariate analyses also include factors related to home background, school context and students' trust in civic institutions in order to explain variation in expected electoral and active political participation. The results show that civic knowledge is related to current engagement as well as expectation of future participation. While students' civic knowledge is positively related to expectations to engage in elections and voting, more knowledgeable students were less willing to consider more active forms of participation.

Perceived democratic school climate and adolescents' civic attitudes and prosocial behavior

Keywords: Attitudes and beliefs, Citizenship education, Secondary education, Student learning

Presenting Author:Aileen Edele, TU Dortmund University, Germany; **Co-Author:**Franziska Schwabe, TU Dortmund University, Germany; **Co-Author:**Birgit Heppert, Humboldt-Universität zu Berlin, Germany

Schools are a key setting to promote citizenship and equip children and adolescents with competencies that are required to support a *culture of democracy*. The current paper determines (1) to what degree students perceive their schools as democratic and whether this perception is related to the attended school track and (2) whether the perceived democratic school climate relates to adolescents' civic attitudes and self-reported prosocial behaviors. We analyzed data of 630 10th grade students (50% female) attending a secondary school in North Rhine-Westphalia, Germany. Students perceived their schools to be fairly democratic. Students attending non-academic school tracks reported higher levels of democratic school climate than students attending the academic school track. In line with our assumptions, students who perceived their school to be more democratic (individual level) reported higher levels of civic mindedness, lower levels of xenophobic attitudes, more prosocial behavior and more helping behavior in class. Moreover, the democratic school climate at the school level related positively to students' civic mindedness and prosocial behavior, and negatively to their traditional gender role attitudes and xenophobic attitudes. Our findings suggest that a democratic school culture promotes civic attitudes and pro-social behaviors.

Participative teaching and democracy in the classroom - important for present and future?

Keywords: Citizenship education, Mixed-method research, Primary education, Teaching approaches

Presenting Author:Elke Hildebrandt, Pädagogische Hochschule FHNW, Switzerland; **Co-Author:**Katja Maischatz, Pädagogische Hochschule FHNW, Switzerland; **Co-Author:**Annemarie Ruess, PH FHNW, Switzerland; **Co-Author:**Sabine Campana, Pädagogische Hochschule FHNW, Switzerland

The UN Convention on the Rights of the Child (CRC) describes the right to participate in several of its articles. It emphasizes the fundamental right of children to freely express their opinion in all matters affecting them. In the reality of everyday teaching, however, it has become clear that this demand has met with little success in the past. Teachers usually only allow participation if their authority is not affected. International studies show that the possibilities for students to participate in school are very limited.

The central question of our research project is, therefore, how participation of pupils in primary education in German-speaking cantons of Switzerland is conceptualized, enabled and promoted. First of all, official documents of cantonal education departments were examined. Subsequently several lessons of seven participating school classes were screened. Using mixed-method research design pupils and their teachers were asked about their participation experiences and concrete offers of lesson participation. In this explorative, qualitatively reconstructive study, internal and external views should be complementary in order to draw a detailed and accurate picture of participatory processes in the classroom and to be able to tap into approaches for their promotion.

The empirical results show that there are at least three indications of a successful promotion of participation: the participatory attitude of the teacher, deliberative communication between the teacher and children, and specific teaching methods and concepts.

Session C 13

12 August 2019 15:30 - 17:00

Seminar Room - S07

Single Paper

Higher Education, Instructional Design, Learning and Instructional Technology

Educational Technology and Instructional Design

Keywords: Developmental processes, Educational Psychology, Educational technology, Experimental studies, Higher education, Instructional design, Motivation and emotion, Multimedia learning

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Cristian Simoni, University of Padua, Italy

Effects of Prior Knowledge and Gaze Following on Learning from Eye Movement Modeling Examples

Keywords: Educational technology, Experimental studies, Instructional design, Multimedia learning

Presenting Author:Ellen Kok, Utrecht University, Netherlands; **Co-Author:**Lucia Chisari, Utrecht University, Netherlands; **Co-Author:**Akville Mockeviciute, Utrecht University, Netherlands; **Co-Author:**Sterre Ruitenber, Utrecht University, Netherlands; **Co-Author:**Lian van Vemde, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Eye movement modeling examples (EMME) are video examples that show the model (an expert, or teacher) demonstrating and explaining a task, as well as where the model is looking. The model's eye movements are superimposed on the video example as dots. Evidence that EMME synchronize students' attention with the model's attention, and would therefore be more effective for learning than regular video modeling examples (ME), is mixed. Recent research suggests prior knowledge might influence effectiveness, with EMME being more effective for low prior knowledge learners. We therefore investigated the effectiveness of an EMME and manipulated learners' prior knowledge, in a 2x2 between-subjects factorial design. Seventy-one students (age $M=23.46$ years, $SD=3.04$) either did or did not receive pre-training on circuit components, and then learned how to diagnose and repair an electronic circuit from studying either an EMME or ME while their eye movements were recorded. Finally, they completed a posttest about troubleshooting. Structural equation modeling (SEM) was used to investigate the relation between students' eye movements during EMME study (i.e., speed of looking at referenced information and extent of model's gaze following) and their learning outcomes. Contrary to expectations, EMME did not lead to higher learning outcomes than ME, and no interaction with prior knowledge was found. SEM provided interesting suggestions as to the mechanisms through which EMME might affect learning: Seeing the model's eye movements helps learners to look at referenced information quicker, and looking at referenced information quicker is associated with higher learning outcomes.

Fear of the unknown – student reluctance to engage in blended learning in undergraduate economics

Keywords: Educational technology, Experimental studies, Higher education, Instructional design

Presenting Author:Julie Buhl-Wiggers, Copenhagen Business School, Denmark; **Co-Author:**Annemette Kjærgaard, Copenhagen Business School, Denmark; **Co-Author:**Lisbeth la Cour, Copenhagen Business School, Denmark

Blended learning has become one of the most popular approaches to innovate teaching practices in higher education. Yet, few randomized evaluations of the effectiveness of this approach exists. In this study we conduct a randomized evaluation of a blended learning initiative implemented in a large undergraduate macroeconomics course. In particular, the blended learning initiative consist of: 1) an adaptive learning platform, which provides instant feedback on exercises and 2) a new format for the exercises, which facilitates active learning through increased group work. The effects of blended learning are measured by differences in academic achievement. On average, we find no significant differences in the final grades. Yet, when exploring the mechanisms behind this result

we find that when adjusting for differences in attendance the treatment increase test scores by 0.15 standard deviations. Our results point to the potential for blended learning to increase academic achievement. Yet, also highlight challenges of getting students on board and thus point to the importance of academic socialization of students into becoming independent learners as an important part of the success of blended learning.

For whom and how? –Effects of digital tools for spatial task solving

Keywords: Educational technology, Experimental studies, Instructional design, Motivation and emotion

Presenting Author: Vanesa Yepes-Serna, Bauhaus University of Weimar, Germany; **Co-Author:** Michael Montag, Bauhaus-University of Weimar, Germany;

Co-Author: Steffi Zander, University of Applied Sciences Magdeburg-Stendal, Germany

Touch-based interaction can simplify mental processes, and tablet computers seem to offer promising opportunities for training spatial abilities considering that spatial tasks were shown to benefit from the use of touch-based gestures and also from the use of dynamic representations. However, there is still a need for a better understanding of whether such interactions also support mental rotation task-solving and if the gender differences presented by the literature differ while using tablets. The present study examined a gender-specific use of touch gestures when solving rotation tasks. Our results revealed that female and male students have pre-existing differences in the expected probability of success and spatial abilities, showing lower values in female students. Females and males differed in regard to success rate when tasks were presented in a mental/non-touch format, though no differences were found when tasks were presented in a physical/touch-based format (tablet computer). Following analyses showed that females and males differ in rotation behavior, indicating an explorative way of solving the tasks on the part of female students, and a more goal-oriented approach in males. Results concerning motivation, gender and behavior are also discussed.

Wrong Predictions > Right Predictions: Generating Predictions as a Productive Exercise in Failure

Keywords: Developmental processes, Educational Psychology, Experimental studies, Instructional design

Presenting Author: Garvin Brod, German Institute for International Educational Research (DIPF), Germany

Two studies will be presented that tested whether and how asking students to generate predictions before presenting them with the correct information is a productive exercise in failure. Study 1 was performed with 36 university students and specifically looked at whether the surprise induced by outcomes that are conflicting with prior knowledge enhances learning. Across two different learning tasks in which participants learned about European geography and soccer, respectively, generating predictions lead to better learning than generating post hoc evaluations. Eye-tracking (pupillometry) measurements revealed that conflicting outcomes led to a surprise response only when a prediction was made beforehand, and that the strength of this response was positively related to the amount of learning. Data from the second task demonstrated that making predictions specifically improved learning of conflicting information. Study 2 compared the effectiveness of generating predictions to another common generative learning strategy, generating examples, in a sample of 25 university students and 25 children (aged 9–11). Participants learned numerical facts about various topics and either generated a prediction or a fitting example prior to seeing the correct number. Results showed that, while differences in learning were marginal in university students, children clearly benefitted more from generating predictions than examples. Again, incorrectly predicted outcomes induced surprise and were better remembered later on than correctly predicted ones. The surprise induced by incorrect predictions, thus, makes generating predictions a productive exercise in failure already in elementary school children.

Session C 14

12 August 2019 15:30 - 17:00

Seminar Room - S10

Single Paper

Teaching and Teacher Education

Video analysis and Mathematics in Teaching and Instruction

Keywords: Mathematics, Quantitative methods, Teaching/instruction, Video analysis

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Carol Aldous, Flinders University, Australia

What is The TALIS VIDEO Study? Rationale, Conceptualization and Design

Keywords: Mathematics, Quantitative methods, Teaching/instruction, Video analysis

Presenting Author: V Darleen Opfer, RAND Corporation, United States

The Organisation for Economic Cooperation and Development (OECD) has sponsored the Teaching and Learning International Survey (TALIS) since 2013, offering a unique international perspective on teaching and learning. The TALIS Video Study (TVS), also sponsored by OECD, is an ambitious and innovative research project that complements TALIS by using lesson videos, classroom artifacts, survey questionnaires and student assessments to gain insight into mathematics teaching and learning. The TVS includes nearly 600 teachers in 8 countries/jurisdictions (Colombia, Chile, Germany, Japan, Madrid (Spain), Mexico, Shanghai (China), and the United Kingdom). This paper provides an introduction to the TVS goals, places them in their socio-historical context, and gives an overview of the study design. Results of this study may inform recommendations concerning teacher education, teacher professional development, school organizations, and other aspects of educational policy.

The Role of Subject Matter in Studying Teaching Across Countries

Keywords: Mathematics, Quantitative methods, Teaching/instruction, Video analysis

Presenting Author: Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany; **Co-Author:** Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland; **Co-Author:** Kristina Reiss, Technische Universität München (TUM), Germany

Opportunity to learn has been established as a powerful concept in international assessments and studies of teaching: The more (and deeper) content students are exposed to, and the more focused and coherent the curriculum is, the more students learn. Thus, measures of teaching – whether observation protocols, questionnaire scales, or instructionally sensitive tests – need to reflect subject matter. But the study design needs to be sensitive to content-specific teaching and learning as well. Single-topic, micro-genetic classroom studies have been shown to be a powerful approach in European research projects, and now this design is being used for the TALIS Video Study, covering eight educational systems in four continents. The paper reports on how to find a common topic and establish common measures of OTL, teaching quality, and student dispositions related to that topic. Results of the Pilot stage provide insights into cross-cultural variation and the methodological challenges of studying it.

Initial Fielding Results from the TALIS Video Study

Keywords: Mathematics, Quantitative methods, Teaching/instruction, Video analysis

Presenting Author: Kata Mihaly, RAND Corporation, United States

The TALIS Video Study (TVS) is collecting detailed information about teaching practices around six domains that were identified by an international consortium of researchers in consultation with the participating countries/jurisdictions and multiple sources from the literature. These domains of teaching practice are measured in the TVS using longitudinal surveys, classroom observations, and classroom artefacts. This paper presents preliminary findings from the fielding of these instruments in the 8 participating countries/jurisdictions including descriptive information about the samples of participating students and teachers, how the scores are created from the instruments, descriptive information on score distributions, and the associations among the domain scores.

Code Development and Rating of Video Recordings and Artefacts

Keywords: Mathematics, Quantitative methods, Teaching/instruction, Video analysis

Presenting Author: Jonathan Schweig, RAND Corporation, United States; **Co-Author:** Courtney Bell, Educational Testing Service, United States; **Co-Author:** Brian Stecher, RAND Corporation, United States

The TALIS Video Study (TVS) examines the relationship between direct measures of teaching practice and related student learning. One of the study's main goals was to test the feasibility of a scalable international study on teaching practices. In the context of collecting video recordings and classroom artefacts, this means: 1) developing appropriate coding schemes to extract valid information about practice, and 2) training raters to apply the codes reliably. This session describes the processes used to develop codes, train "Master Raters" from each jurisdiction to apply the codes and, in turn, train local raters in each of their jurisdictions. Finalized observation codes and artefact codes will be presented. Results of the recruitment and certification processes provide initial information about the consistency and quality of the rating process.

Session C 15

12 August 2019 15:30 - 17:00

Seminar Room - S12

Single Paper

Motivational, Social and Affective Processes, Teaching and Teacher Education

Attitudes and Beliefs, Motivation and Emotion

Keywords: Attitudes and beliefs, Educational policy, Emotion and affect, Informal learning, Intelligence, Interdisciplinary, Motivation, Primary education, Qualitative methods, Quantitative methods, Vocational education

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 25 - Educational Theory

Chairperson: Kate Xu, Welten Institute - Open University of the Netherlands, Netherlands

Why are some subjects less popular than others? Extending the debate

Keywords: Attitudes and beliefs, Educational policy, Interdisciplinary, Qualitative methods

Presenting Author: Filio Constantinou, Cambridge Assessment, University of Cambridge, United Kingdom

School subjects are not equally popular. Various accounts have been proposed to explain this phenomenon. These are typically theoretical, portraying the subject hierarchy as a derivative of a perennial tendency in society to attach different importance to different types of knowledge. This paper will put forward an alternative explanation that emerged from empirical work on an increasingly unpopular A level subject (Design and Technology). At the core of the proposed explanation lies the observation that the mechanisms that drive the popularity of school subjects are similar to the mechanisms that, according to the marketing literature, drive the popularity of brands. Taking an interdisciplinary approach to understanding the subject hierarchy, this paper will argue that one route to addressing this enduring educational issue is that of 'rebranding' unpopular subjects.

Measuring vocational teacher students autonomy-supportive beliefs. Validation of the PIS.

Keywords: Attitudes and beliefs, Motivation, Quantitative methods, Vocational education

Presenting Author: Juliane Breitschopf, Technical University of Munich, Germany; **Co-Author:** Eveline Wittmann, Technische Universität München, Germany

According to the self-determination theory of Deci & Ryan (1993), teacher autonomy-support has a positive impact on student motivation. Various studies confirm this theory largely (Prenzel et al 1996, Patall et al., 2013). The aim of this study is to measure the beliefs of student teachers and in-service teachers about autonomy-support in a reliable and valid way. For this purpose, we translated and adapted the "Problems in School" questionnaire by Deci et al. (1981) for German secondary school teachers and teacher training students. After a pretest with German teachers (n = 33), the questionnaire was adjusted and extended by 16 items. Subsequently, we performed a confirmatory factor analysis using data from a sample of vocational teacher students (n = 327). After reducing the original 48 to 17 items, the data show a good model fit for the assumed four factors. ($X^2=142.4$, $df=113$, $RMSEA=0.29$, $CFI=0.96$, $SRMR=0.048$). For composite reliability, the scales demonstrate acceptable values of 0.62 to 0.66. Measurement invariance over time was found on all levels for a part of the participants (n=114), tested again after six months. We also found weak and partial strong measurement invariance for gender.

Estonian and Finnish 4th grade students' mindsets about intelligence

Keywords: Attitudes and beliefs, Emotion and affect, Intelligence, Motivation

Presenting Author: Elina Kuusisto, University of Humanistic Studies, Netherlands; **Co-Author:** Kati Aus, Institute of Psychology, Estonia; **Co-Author:** Grete Arro, Tallinn University, Estonia; **Co-Author:** Kirsi Tirri, University of Helsinki, Finland

This study investigates Estonian and Finnish 4th grade student's mindsets about intelligence. Dweck (2000) has identified two mindsets that influence learning processes and motivation. Fixed mindset refers to implicit beliefs where intelligence is seen stable and growth mindset refers to beliefs where intelligence is understood as malleable and changeable. The former leads to an avoidance of challenging learning opportunities, whereas the latter motivates students to enjoy difficult tasks and rebound from their mistakes. The present study is conducted in two countries, Finland and Estonia. This study examines 1 To what extent two different mindset-instruments are measuring the same phenomenon? 2 To what extent does country explain differences in students' mindsets and preference for doing (a) easy tasks? (b) difficult tasks? The sample consisted of 368 fourth grade students 184 from Finland and 184 from Estonia. Results show that Dweck's (2000) and Gunderson et al.'s (2013) instruments do not measure the same mindset construct. Dweck's items seem to capture the mindset, but Gunderson et al.'s mindset related behaviors. Further, results indicate that in both Estonia and Finland the basic idea of growth mindset and malleability of intelligence has spread among 4th grade students. However, it seems that in Estonia this knowledge does not result in growth mindset behavior.

Determinants of musical leisure time activities in boys and girls

Keywords: Attitudes and beliefs, Informal learning, Motivation, Primary education

Presenting Author: Marcus Penthin, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; **Co-Author:** Eva Susanne Fritzsche, Department of Teacher Education, Germany; **Co-Author:** Stephan Kroener, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

In most cases, people start playing musical instruments or singing in choirs in their childhood. For this reason, knowing the decisive factors that lead to participation in musical activities could be a starting point for music educational interventions. Therefore, in a first study scales have been developed and tested for the assessment of musical leisure time activities that, according to the model of person-environment transaction, took into account domain-specific individual as well as environmental determinants. Musical self-concept turned out to be a key determinant. After some item revisions and the extension of the constructs, in study two controllability, musical self-concept, the instrumental aspect of attitude towards musical activities and the perceived musical activity of the mother explained 76 % of variance in musical leisure time activities a structural equation model. However, attention needs to be paid to gender-specific differences of the determinants.

Session C 16

12 August 2019 15:30 - 17:00

Seminar Room - S15

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Achievement, Arts, Attitudes and beliefs, Competencies, Educational technology, Ethnography, Interdisciplinary, Knowledge creation, Meta-analysis, Mixed-method research, Pre-service teacher education, Qualitative methods, Secondary education, Teacher professional development

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Marco Longhitano, Switzerland

Content Knowledge and Pedagogical Content Knowledge of Teachers – A Meta-Analysis across 7 subjects

Keywords: Competencies, Interdisciplinary, Meta-analysis, Teacher professional development

Presenting Author:Stefan Krauss, University of Regensburg, Germany; **Co-Author:**Alfred Lindl, University of Regensburg, Bavaria, Germany; **Co-Author:**Anita Schilcher, University of Regensburg, Bavaria, Germany

In the talk, the results of the German FALKO-research group ("Fachspezifische Lehrerkompetenzen"; subject specific teacher competences) will be presented. The research is based on Shulman's theoretical taxonomy of professional teacher knowledge and its modelling in the COACTIV study on mathematics teachers. In FALKO both the content knowledge (CK) and the pedagogical content knowledge (PCK) of secondary teachers were operationalized in six other highly diverse domains according to the conceptualizations of the respective COACTIV knowledge tests. The subjects include German as a first language, English as a foreign language, Latin, Physics, Music and Religion. Thus, in the FALKO-project subjects are integrated in a common research paradigm that centres on a shared theoretical framework. As such, it develops a new trajectory towards highly interdisciplinary empirical research. All tests were administered with samples of teachers (N = 741) and teacher students (N = 853) of the respective subjects. In the talk, test construction and empirical results regarding psychometric criteria, differences in PCK and CK between teachers and teacher students and school type differences will be presented in a comparative manner. A final meta-analysis will be reported, which will also include new data from the COACTIV study on mathematics, in order to examine determinants and structures of the domain-specific professional knowledge (PCK and CK) of (prospective) teachers not only on a broad data basis but also across seven disciplines (N = 1.594).

Art therapy technique of collage as a tool to reflect on teachers' professional identity development

Keywords: Arts, Attitudes and beliefs, Pre-service teacher education, Qualitative methods

Presenting Author:Iva Stuchlikova, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Yvona Mazehoova, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Jana Kourilova, University of South Bohemia Ceske Budejovice, Czech Republic

Professional identity is constructed by the individual who carries out the role and is based on the person's values, beliefs, attitudes, feelings and understandings (Forde et al., 2006). Future teachers, who start thinking about themselves as teachers, usually consider multiple identities to meet competing demands and expectations related to expected profession. This can lead to a sense of volatility and uncertainty (Forde et al., 2006) and it is therefore important for student teachers to pursue the issue of emerging professional identity in their pre-service training. The study presents projective technique of collage that is used for mapping of anticipated professional roles of future teachers. Collage, both as a process and as a product, reflects on current status of student teachers' professional identity. This experience opens space for deepening the students' understanding of the profession as well as for further development of their professional identity. The paper summarizes this specific use of collage technique and describes also a typology of the professional identity collages of freshmen student teachers.

General pedagogical knowledge and school practice revisited—reconstruction as a backward design tool

Keywords: Ethnography, Knowledge creation, Mixed-method research, Teacher professional development

Presenting Author:Christian Kraler, Teacher Education and School Research, Austria; **Co-Author:**Ann-Kathrin Dittrich, Teacher Education and School Research, Austria

Teachers' professional pedagogical knowledge is currently a pertinent topic in education. The specific kind of professional pedagogical knowledge for sustainable learning is one of the current discussed question. The first comprehensive model regarding teacher knowledge presented by Shulman (1987), classifies it into subject, pedagogical content and general pedagogical knowledge. Recently, Voss & König's internationally comparative studies provided the first operationally normative studies on general pedagogical knowledge. The research project is part of the Teacher Education Research Group (TERG) at the University of Innsbruck and focuses on general pedagogical knowledge in professional practice. Considering social-political challenges the field research stage of the study adopts a qualitative approach, which is based on an inductive ethnographical reconstructive strategy. The idea is to build a framework for classifying domains and categories of general pedagogical knowledge and making it visible. Interviews and subsequent observations with teachers are undertaken to demonstrate pedagogical knowledge and to explore how teachers act in the classroom. Results show that the majority of teachers struggle with the concept but each teacher has a highly individual understanding and conceptualization. The understanding of general pedagogical also depends on the type of school. It becomes evident that differences between the cognitive concept of pedagogical knowledge and their performative acting in school exist.

Effectiveness of the Flipped Classroom in K-12 Education: A Meta-Analysis

Keywords: Achievement, Educational technology, Meta-analysis, Secondary education

Presenting Author:Marlene Wagner, University of Passau, Germany; **Co-Author:**Andreas Gegenfurtner, University of Passau, Germany; **Co-Author:**Detlef Urhahne, University of Passau, Germany

This meta-analysis (25 articles, $k = 44$ independent data sources, $N = 2,223$) examines the effects of flipped classroom on student achievement in K-12 education. The flipped classroom model refers to an instructional approach in which the traditional class-time and self-study activities are spatially and temporally flipped: students watch educational videos at home and homework assignments are done in class. The meta-analytic findings reported here provide significant evidence for the effectiveness of flipped classrooms on student achievement in comparison to traditional classroom instruction (Cohen's $d = 0.42$, 95% $CI [0.20 - 0.63]$, $Z = 3.81$, $p < .001$). Four boundary conditions were estimated. First, effect sizes were higher for disciplinary fields related to STEM (science, technology, engineering, mathematics) compared to languages and humanities. Second, effect sizes were higher in flipped classroom interventions of shorter than longer duration. Third, the use of a quiz in class or at home had only small effects on achievement outcomes. Fourth, effect sizes were higher in interventions without rather than with learning management systems (LMS). Findings are discussed in terms of their implications for theoretical frameworks of the flipped classroom and their significance for educational practice.

Session C 17

12 August 2019 15:30 - 17:00

Seminar Room - S16

Single Paper

Teaching and Teacher Education

In-service Teacher Education

Keywords: In-service teacher education, Mathematics, Qualitative methods, Secondary education, Social interaction, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Diego Oswaldo Camacho Vega, Mexico

Examining the impact of PD on teacher knowledge, instructional practice, and student achievement

Keywords: In-service teacher education, Mathematics, Teacher professional development, Teaching/instruction

Presenting Author:Nanette Seago, WestEd, United States; **Co-Author:**Karen Koellner, Hunter College--CUNY, United States

Professional development (PD) that sets ambitious goals for teacher learning is in high demand. In the mathematics field, PD aligned with the Common Core State Standards is especially needed to help teachers gain mathematical knowledge for teaching and develop fluency in making instructional decisions that support students' learning of challenging content. The Learning and Teaching Geometry intervention consists of well-specified PD materials that engage teachers in learning complex mathematical concepts through video cases. We describe a group-randomized efficacy study examining the effectiveness of this intervention. Our findings suggest that the intervention strongly impacted teachers' instructional practice, leading to some student learning improvements.

The Preparation of Facilitators for Adaptive Professional Development

Keywords: In-service teacher education, Mathematics, Teacher professional development, Teaching approaches

Presenting Author:Hilda Borko, Stanford University, United States; **Co-Author:**Janet Carlson, Stanford University, United States

Grossman and colleagues (2009) identified three pedagogies of practice central to preparing professionals such as teachers, clinical psychologists, and clergy: representation (e.g., modeling), decomposition (identifying elements of a complex practice), and approximation (e.g., rehearsals). This presentation extends their framework by analyzing the nature and impact of using these pedagogies to prepare facilitators of teacher professional development. Our research team worked with teacher leaders at 8 middle schools to prepare them to lead 6 site-based professional development workshops over the course of a school year. Analyses of video-recordings of the leadership preparation meetings indicated that team members explicitly modeled and debriefed four research-based categories of moves that experienced mathematics PD leaders use for engaging teachers in VBDs: orienting teachers to the video analysis task; sustaining an inquiry stance; maintaining a focus on the classroom video and students' mathematical thinking, agency and identity; and supporting group collaboration. TLs then planned and rehearsed VBDs for their workshops. They incorporated the four categories of facilitation moves more in the VBDs during their final workshops than initial workshops. This presentation contributes to the theoretical and empirical literature on preparing PD leaders and provides suggestions for the types of activities to include in facilitator preparation programs.

Developing teacher laterality in a centralized education system

Keywords: In-service teacher education, Qualitative methods, Social interaction, Teacher professional development

Presenting Author:Junsong Huang, National Institute of Education, Singapore; **Co-Author:**Imran Sha'ari, National Institute of Education/Nanyang Technological University, Singapore, Singapore

In decentralized education systems, peer-to-peer lateral relationships among teachers facilitate their learning. We wonder whether such relationships also matter in centralized systems where hierarchical structures are established to facilitate teacher learning. This paper illuminates how lateral relations grow and facilitate teacher learning in the Singapore context. We explore task-relational interplay to understand the interactions between the design of collaborative learning tasks and the emergence of lateral relations among teachers. We first reveal that lateral relationships among teachers develop and complement hierarchical structures to support teacher learning. We then illustrate how the design of a collaborative learning task influences the emergence of such lateral relationships. Some considerations are discussed on how to facilitate the expansion of relationships from hierarchical to lateral.

Validating the Spanish Approaches to Teaching Inventory with Mexican telesecundaria teachers

Keywords: In-service teacher education, Secondary education, Teacher professional development, Teaching approaches

Presenting Author:Carla Quesada-Pallarès, Universitat Autònoma de Barcelona, Spain; **Co-Author:**Anna Ciraso, Universitat Autònoma de Barcelona, Italy;

Co-Author:Lori Caudle, Western Carolina University, United States; **Co-Author:**Edith Mariana Rebollar Sánchez, Insituto Superior de Ciencias de la Educación del Estado de México, Mexico

Telesecundaria, or blended learning in Mexico, uses ICT as the main resource, particularly the television, and the satellite network infrastructure, allowing young people from rural and marginalized urban areas to complete their basic education. But telesecundaria teachers in Mexico need professional development to support their PBL approaches to teaching. This study aims to validate a Spanish version (S-ATI-20) of the Approaches to Teaching Inventory (ATI) with Mexican teachers. The study utilized a quasi-experimental design with two groups and a post-test measure after teachers completed a training on PBL. The sample was 296 and the S-ATI-20 was applied. A confirmatory factor analysis with a hypothesized two-related factors model was performed using AMOS 23 with maximum likelihood estimation. Even though some of the fit indexes indicate that further analysis is still needed (TLI=.848; CFI=.864; HOELTER index=149), the results confirm the questionnaire structure proposed by Monroy, González-Geraldo, and Hernández-Pina (2015), confirming the reformulations introduced with the S-ATI-20 and providing a validated model to explain approaches to teaching styles in Mexican secondary teachers.

Session C 18

12 August 2019 15:30 - 17:00

Seminar Room - S09

Single Paper

Culture, Morality, Religion and Education, Learning and Instructional Technology, Teaching and Teacher Education

Attitudes, Beliefs and Motivation

Keywords: Attitudes and beliefs, Early childhood education, History, Learning Technologies, Metacognition, Motivation, Self-efficacy, Social sciences, Student learning, Teaching/instruction, Values education, Writing/Literacy

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 19 - Religions and Worldviews in Education

Chairperson: Ann Dowker, University of Oxford, United Kingdom

A review of writing motivation research since 2000

Keywords: Attitudes and beliefs, Motivation, Self-efficacy, Writing/Literacy

Presenting Author:Ana Camacho, University of Porto, Portugal; **Co-Author:**Pietro Boscolo, Università di Padova, Italy; **Co-Author:**Rui Alexandre Alves, University of Porto, Portugal

The role of motivation in school writing has been acknowledged in the past decades. However, a recent comprehensive systematic review synthesizing the main findings is lacking. Moreover, problems are pervasive in how the motivational constructs are defined in writing research. The present study reports a systematic review of writing motivation research published between 2000 and 2018 in peer-reviewed journals. The aims were twofold: analyzing how motivational constructs were defined in writing research and synthesizing the results of writing motivation studies. Database and legacy searches located 3791 possible articles that were narrowed down to 79 articles. Eligible articles were written in English, focused on students from grades 1 to 12, and included at least one measure of writing motivation. Implicit or absent definitions were more frequent than explicit definitions. Several studies showed that girls are more motivated to write than boys and some articles found evidence favoring younger students over older students. ICT-based interventions are beneficial for students' writing motivation. Future studies should offer explicit definitions of motivational constructs and employ longitudinal designs to further examine age differences and the impact of digital technologies on writing motivation. Teachers could rely on motivational strategies to boost students' writing performance in the classroom.

How do teachers decide on the classroom time they invest in different learning goals?

Keywords: Attitudes and beliefs, History, Motivation, Teaching/instruction

Presenting Author:Michiel Voet, Ghent University, Belgium; **Co-Author:**Bram De Wever, Ghent University, Belgium; **Co-Author:**Iris Huiders, Ghent University, Belgium

An understanding of how teachers divide available classroom time among different learning goals is invaluable to training that aims to change existing classroom practices. While some studies have used expectancy-value theory to explain teachers investment of classroom time in different learning goals, there has so far been little attention to other theories of motivation, which may help to further explain teachers' instructional decision-making. At present, self-determination theory is one of the most widely used theories of motivation in educational research. This contribution explores the extent to which a framework that incorporates insights from both theories can explain teachers' instructional decision-making. The framework proposes four determinants of teachers' investment of classroom time in different learning goals: perceived value, self-efficacy, personal enjoyment, and external pressure. Empirical investigation of the framework took place within the context of history education, where 141 teachers completed a questionnaire. These data were then used to estimate multilevel models, with time invested in a learning goal as the dependent variable, and the four determinants as the independent variables. The main finding of these analyses is that the time teachers invest in a learning goal is significantly related to its perceived value and, in most cases, teacher self-efficacy, but not to

personal enjoyment or external pressure.

Values and 'Cultural Heritage' in Early Childhood Education and Care in Finland and Sweden

Keywords: Attitudes and beliefs, Early childhood education, Social sciences, Values education

Presenting Author:Arniika Kuusisto, Stockholm University, Sweden

Intensified patterns of migration and change in society at large has contributed into an accelerated pluralisation in many countries. The layered, situated effects of 'old' and 'new' diversities (Vertovec 2015) have also produced shifting patterns of prejudice, segregation, inequality and conflict (Ritzvi 2011). Increasing superdiversity of values, worldviews, cultures and traditions is also a part of the Early Childhood Education and Care (ECEC) communities. Although to some extent this is already being acknowledged in many of the international and national policy guideline documents, there is a lot of uncertainty among the educational practitioners as regards the way in which these should be implemented in practice. In Sweden, national curriculum guidelines for ECEC include a focus of transmitting 'cultural heritage' to children, whereas Finnish curriculum includes education on the worldviews that are 'present in the group of children' through their family traditions. This paper discusses 'cultural tradition' and 'worldview education' from the perspectives of nation-construction, citizenship, human rights and educational value basis of societal education in the context of ECEC.

Learning as Identity Change in Augmented Virtual Learning Environments

Keywords: Learning Technologies, Metacognition, Motivation, Student learning

Presenting Author:Amanda Barany, Drexel University, United States; **Co-Author:**Hamideh Talafian, Drexel University, United States; **Co-Author:**Mamta Shah, Drexel University, United States; **Co-Author:**Aroutis Foster, Drexel University, United States

This paper illustrates the application of Projective Reflection (PR) in an ongoing National Science Foundation CAREER Study. PR is a theoretical model that frames the design and implementation of virtual learning environments (VLEs such as games) and associated curriculum for promoting identity exploration over time, resulting in identity change. PR conceptualizes identity exploration as shifts in learners' domain-specific (a) knowledge, (b) interests and values, (c) patterns of self-organization and self-control, and (d) self-perceptions and self-definitions. Such shifts may be triggered through participation in a designed experience that promotes intentional and targeted reflection on specific role identities. PR was used to design *Philadelphia Land Science (PLS)*, a VLE designed to promote exploration of possible roles in urban planning and environmental science careers. A 9-week augmented virtual learning environment (AVLE) course, *Virtual City Planning*, was created and implemented using *PLS* in a museum classroom with freshmen high school students. In-game and in-class student data and mentor observations were collected and analyzed using a deductive coding approach to qualitatively identify patterns of identity exploration enacted over time. This paper offers group findings to illustrate general trends of identity exploration during the AVLE, and one illustrative case study to provide an in-depth look at an integrated identity exploration trajectory. This work concludes with a discussion of the need for learning experiences that can promote identity exploration in the 21st century, and the affordances of augmented virtual learning environments for developing the adaptability and flexibility learners will need to remain competitive in this context.

Session D 1

13 August 2019 08:30 - 10:00

Lecture Hall - H10

SIG Invited Symposium

Teaching and Teacher Education

SIG 23: Social interaction in school improvement and its relation to teacher and student learning

Keywords: Communities of learners, Communities of practice, Developmental processes, Quantitative methods, Quasi-experimental research, School effectiveness, Teacher Effectiveness, Teacher professional development, Workplace learning

Interest group: SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Katharina Maag Merki, University of Zurich, Switzerland

Discussant: Tobias Feldhoff, Johannes Gutenberg University of Mainz, Germany

Abstract:The benefits of strong professional communities of teachers have recently gained increased attention (Vangrieken et al., 2017). However, due to substantial methodological and theoretical limitations in previous research, it is unclear what social interactions in professional communities are like if we take formal and informal learning as well as daily practices of teachers into account. Furthermore, previous research does not provide sufficient evidence on the relation between these social interactions and instruction and teachers' and students' learning. Against this background, the symposium will focus on the social interactions of teachers in schools. It aims to identify important social interactions in schools, analyze their preconditions, compare them between schools and relate them to teachers' and pupils' learning. In doing so, the symposium will significantly extend the literature by applying innovative methodological approaches, such as social network analysis, time-sampling methods, systematic review, and quasi-experimental research. The relevance of the symposium is twofold. The results will provide new insights into relevant preconditions of school improvement processes. Furthermore, empirical evidence on the coherence of teacher communities and the coupling between the subsystems (Weick, 1976) might aid the discussion on what kind of support teacher communities will need in the future. Vangrieken, K., Meredith, C., Packer, T. & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education*, 61, 47–59. Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21, 1–19.

Social interactions in schools concerned with new ideas for teaching, teamwork and school design.

Presenting Author:Andrea Wullschleger, University of Zurich, Switzerland; **Co-Author:**Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Beat Rechsteiner, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Nathanael Schori, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Ariane Rickenbacher, Institute of Education, University of Zurich, Switzerland

To understand how improvement takes place in schools, a study was carried out into how members of school teams interact as a professional learning community. For improvement to take place, school teams members have to communicate, share, develop, and transform new ideas about teaching and learning in their school. The aim of this paper is to investigate the exchange of new ideas in school teams concerned with teaching, team collaboration and the design of the school. Members of teams in four lower secondary schools (N = 87) in the German-speaking part of Switzerland were invited to participate in an online survey. They answered questions about whom they exchanged new ideas with and the data obtained were analysed using social network analysis. The findings of this exploratory study suggest that, all in all, the exchange of ideas in school teams is not as consistent across schools as might be expected. The results indicate that some individuals are more popular and have more influence in the context of the design of the school compared to the other contexts.

Teacher collaboration and teacher motivation in the context of school improvement

Presenting Author:Nina Kolleck, Freie Universität Berlin, Germany

The mutual dependency of teacher collaboration and motivation has emerged as a promising research field (Moolenaar, Slegers, & Daly, 2012). Different studies have shown that the social interactions between teachers are key determinants of student motivation and that teacher collaboration supports teacher motivation and effectiveness. Whereas the issues of teacher collaboration and teacher motivation have been addressed in different review studies, a systematic review of the interplay between them is still missing from the academic literature. Four decades after the publication of the seminal work of Lortie (1975) which set the stage for a rapidly growing research program on both teacher motivation and collaboration, this article focuses on the relationship between teacher collaboration and teacher motivation and searches for responses to the main research questions: *What can studies tell us regarding the motivations of teachers to collaborate with other teachers? What effects of teacher collaboration on teacher motivation are discussed in the academic literature?* To answer these questions, it synthesizes new contributions with innovative theoretical conceptualizations and recent empirical findings, maps the conceptual, methodological and empirical advances of the last decades of rich research, outlines avenues for future research and sketches implications for praxis.

Cooperative regulation activities of teachers, analysed based on time-sampling data

Presenting Author:Katharina Maag Merki, University of Zurich, Switzerland; **Co-Author:**Urs W. Grob, University of Zurich, Switzerland; **Co-Author:**Beat Rechsteiner, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Ariane Rickenbacher, Institute of Education, University of Zurich, Switzerland; **Co-Author:**Andrea Wullschleger, University of Zurich, Switzerland

The study emphasizes the cooperative regulation activities of teachers, since previous research revealed the high importance of these activities for school improvement and innovation. However, in previous research severe shortcomings can be identified. There is a lack of longitudinal analysis that investigates informal cooperative learning activities quantitatively, considering performance-related day-to-day activities. The present study refers to these research deficits and analyses teachers' regulation activities in four secondary schools based on time-sampling methods, a method that allows more valid identification of these activities. The following questions are focused: What cooperative regulation activities do teachers perform, and what is their frequency? With whom do teachers cooperate, and are there differences between schools? To what extent do these cooperative activities vary over 3 weeks? To what extent are daily cooperative regulation activities related to daily perceptions of benefit, satisfaction, and stress? Professional activities of teachers were assessed based on a newly developed daily online practice log during 21 days (N=81 teachers). The results revealed that cooperative activities were primarily to discuss administrative-organizational questions and only to a lower degree to discuss subject-specific questions. On days when teachers performed cooperative activities, the teachers perceived a significantly higher level of benefits but also a significantly higher level of stress. Interestingly, the effect of cooperative regulation activities on daily satisfaction and on teaching development was not significant. The effects on the benefits for team and school development were strong ($d \geq 0.72$). Implications for practice and research as well as limitations are discussed.

The Impact of a Two-Year Intervention on Improving School Effectiveness: The Dynamic Approach

Presenting Author:Maria Vrikki, University of Cyprus, Cyprus; **Co-Author:**Leonidas Kyriakides, University of Cyprus, Cyprus; **Co-Author:**Evi Charalambous, Department of Education, University of Cyprus, Cyprus

This paper investigates the extent to which the Dynamic Approach to School Improvement (DASI) can help schools in socially disadvantaged areas to develop strategies and action plans in order to improve their learning environment and their policy for teaching and through that to promote student learning outcomes in Mathematics. The study also aims to examine the added value of offering DASI for more than one school year. At the beginning of the school year 2015-2016, a sample of 72 primary schools in four European countries (Cyprus, England, Greece and Ireland) was selected and randomly split into the experimental and control groups. The experimental group made use of DASI to develop improvement strategies and action plans. Feedback was provided to the control group regarding their students' achievement and their school's policies. During the next school year, most experimental schools in three countries (Cyprus, Greece and Ireland) made use of DASI. At the beginning and at the end of each school year, we administered a battery of mathematics tests to all students of Grades 4-6 of the school sample and a teacher questionnaire measuring the school policy and actions taken to improve teaching and the school learning environment. Multilevel analysis revealed that schools in the experimental group managed to achieve better results compared to those in the control group at the end of each school year of the project, while students' achievement gains were bigger for schools that have continuously implemented the program over the two-year period. Implications of findings are drawn.

Session D 2

13 August 2019 08:30 - 10:00

Lecture Hall - H11

Symposium

Motivational, Social and Affective Processes

Possibilities of different research instruments for investigating emotions on learning of employees

Keywords: Content analysis, Developmental processes, E-learning/ Online learning, Emotion and affect, Lifelong learning, Mixed-method research, Psychometrics, Qualitative methods, Quantitative methods, Teacher professional development, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Regina Mulder, University of Regensburg, Germany

Organiser: Verena Watzek, University of Regensburg, Germany

Discussant: Tina Hascher, University of Bern, Switzerland

For meeting future challenges employees need to develop themselves. Since the focus in research is mainly on cognitive processes and/or learning outcomes, less is known about the role of emotions in employees' individual and social learning processes. However, there is evidence that emotional challenges can emerge during, for instance, teamwork influencing professionals' cognitive learning processes. In addition, insight is needed into how the role of emotions can be investigated. This symposium increases the insight into the possibilities of investigating the role of emotions for professional development by presenting different research designs, and instruments and their limitations. Paper 1 gives insight into the use of self-reports and psychophysiological data to investigate emotions in professional learning. Paper 2, focuses on benefits and drawbacks of self-reports to measure emotions in career development and adult learning. Paper 3 uses a mixed-method design with observations and a questionnaire to explore emotions in work teams. Paper 4 focuses on data from an online professional learning tool to investigate strategies used to regulate professionals' emotions.

Additionally, this symposium increases insight into how professionals' development in work-related contexts is related to emotions and what the implications of the research outcomes are for practice of professional development at work in different jobs and domains. The discussant will reflect on both the research methods and the outcomes of all research projects. In order to stimulate the debate, the participants of the symposium will have the opportunity to submit their comments on a web-based interactive application during the presentation.

Using self-reports and electrodermal activity (EDA) measurement in studying emotions in learning

Presenting Author:Susanna Paloniemi, University of Jyväskylä, Finland; **Co-Author:**Markku Penttonen, University of Jyväskylä, Finland; **Co-Author:**Päivi Hökkä, University of Jyväskylä, Finland; **Co-Author:**Katja Vähäsantanen, University of Jyväskylä, Finland; **Co-Author:**Anneli Eteläpelto, University of Jyväskylä, Finland

Studies on emotions in learning are mostly conducted via interviews after the learning situation, and they seldom focus on professional or work-related learning. Challenged by this, we examine emotions that emerge *in* professional learning. We understand emotions as dimensional, multicomponential, and situational responses to personally meaningful events and situations, and address them as concurrent subjective experiences and psychophysiological responses. The research participants were five university teachers. Data collection took place in a laboratory setting where the participants watched video episodes that they had reported as the most meaningful for their learning in an Identity Coaching program in which they had previously participated. The participants assessed and reported their subjectively experienced emotions via an online Emotion Circle (EC) application and, further, through an emotion-driven Stimulated Recall Interview (SRI). Concurrently, subjects' electrodermal activity (EDA), indicating the activity of their sympathetic nervous system, was measured. The findings of the self-report data revealed a variety of both pleasant (e.g., *joy, excitement*) and unpleasant (e.g., *frustration, shame*) emotions. Further, the visual process analysis (Manolov & Onghena, 2017) of self-reported emotions and EDA illustrated the concurrent variation of these within the subjects. A comparison between the participants showed individual differences in the connections between self-reports and EDA. The findings are discussed in terms of the possibilities and limitations of using complementary data in researching emotions in professional learning. Additionally, we discuss the educational significance of the findings and the need to develop multimethod approaches for understanding emotions in authentic professional learning contexts.

The rocky road to emotion measurement in learning and career development: on the use of self-reports

Presenting Author:Thomas Pirsoul, Université Catholique de Louvain (UCL), Belgium; **Presenting Author:**Michaël Parmentier, Université Catholique de Louvain (UCL), Belgium; **Co-Author:**Frédéric Nils, Université catholique de Louvain (UCL), Belgium

Emotion pervades all spheres of human life. However, it is surprising to notice the scarcity of research tapping into the role of emotion in career development

and learning, especially given its interpersonal and relational nature. One of the most limiting factor in the study of emotion has been its elusive nature, making it difficult to define and measure it. Accordingly, a plethora of different emotion measures have emerged in the literature and measuring emotion can become a very tedious task for researchers. In this presentation, we propose to discuss several issues regarding the use of self-report measures of emotion. Specifically, we will outline the main advantages and drawbacks of using self-report measures in surveys. Three self-report measures will be exemplified from several studies and datasets investigating emotion (1) in the context of the school-to-work transition anticipation (N=270), (2) in adult learning settings (N=256), and (3) investigating learning intentions of a sample of employees (N=2000). Drawing from these research examples, we will invite researchers to think about self-report use according to (1) their conceptualization of emotion, (2) the aims of their research and how they model emotion, and (3) their methodological design. In order to stimulate the debate, the participants of the symposium will have the opportunity to submit their questions and their experiences regarding self-report measures on a web-based interactive application during the presentation.

The use of questionnaires and observations in investigating affective reactions within teamwork

Presenting Author:Verena Watzek, University of Regensburg, Germany; **Co-Author:**Andreas Widmann, University of Regensburg, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Based on previous research, the need arose to explore dynamics and behavioural changes within teams over time, including affect inherent in teamwork and related to learning in teams. This study focuses on investigating affective reactions within teamwork by the use of questionnaires and observations. The first part of this study consisted of surveys completed by 278 members of 67 work teams at the beginning (T1), middle (T2) and end (T3) of a school year. In addition, a total of 29 meetings of six of these teams were observed to provide in depth understanding of affective reactions within teamwork. Affective reactions were measured with validated scales and analysed by using a category system developed on the basis of the system established by Bale's (2002) for the analysis of team observations. The findings of the data revealed that various positive (e.g. happiness, confidence) and negative affective reactions (e.g. anger, frustration) occurred during teamwork. Based on the observation data, in-depth insight into triggers of affective reactions as well as team's affective interaction is provided. In the presentation we will outline the measurement and analyses of affective reactions, in detail. In addition, the possibilities and limitations of both research methods to investigate affective reactions within teamwork over time are discussed. Finally, we discuss the theoretical and educational significance of the study's findings.

Using online data to identify strategies that teachers use to regulate emotions

Presenting Author:Susan Beltman, Curtin University, Australia; **Co-Author:**Emily Poulton, Curtin University, School of Education, Australia

Teaching can be an emotionally challenging as well as rewarding profession. Negative emotions associated with stress and burnout are of concern regarding the quality retention of early career teachers, experienced teachers and school leaders. This paper analyses data from an online professional learning tool and examines strategies recommended by 73 practicing teachers (12 male) as they completed online modules designed to enhance preservice teachers' capacity for resilience (BRiTE: Building Resilience in Teacher Education). Invited to name the "top 3 strategies for managing your emotions when you feel your emotions becoming heightened", 211 separate strategies were coded inductively through an iterative process of category development. Responses were further coded into four higher order categories. For example, the largest group of responses referred to the need to take a physical or mental break to calm oneself and manage the heightened emotions. A chronological progression of responses was identified within and across participants. During the presentation we will outline the coding procedure in detail. Findings will be discussed in terms of the possibilities and limitations of qualitative analysis of large online data in researching concepts such as emotions in professional learning.

Session D 3

13 August 2019 08:30 - 10:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Teaching and Teacher Education

Importance of teacher characteristics for instructional quality

Keywords: Educational Psychology, Primary education, Quantitative methods, Secondary education, Self-efficacy, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Justine Stang, TU Dortmund University, Germany

Organiser: Justine Stang, TU Dortmund University, Germany

Organiser: Nele McElvany, TU Dortmund University, Germany

Discussant: Christoph Helm, Johannes Kepler University Linz, Austria

Instructional quality is important for students' academic success. As known from several utilization-of-learning-opportunities-models, teacher characteristics (e.g., attitudes, knowledge, motivation) can influence teachers' instructional quality (e.g., classroom management, monitoring). For certain teacher characteristics like some types of knowledge empirical findings indicate relationships to instructional quality. Others are less researched. Therefore, the aim of this symposium is to investigate the relationship between several teacher characteristics and instructional quality. The first presentation focuses on heterogeneity-related teaching attitudes and motivation and its relation to differentiated instruction as one aspect of instructional quality in heterogeneous classrooms in elementary schools. The second presentation analyzes the relationship between three teacher professional knowledge types and instructional quality in primary and secondary education. The third presentation focusses on the change in students' class-level perceptions of instructional quality from Grade 5 to Grade 6 and analyzes whether teachers' self-efficacy and enthusiasm are relevant predictors of the change in instructional quality. The fourth presentation examines the relationship between teacher characteristics and several aspects of instructional quality during a school year in Grade 7 and analyzes whether characteristics like job satisfaction are predictive for instructional quality. The symposium brings together important lines of current research on instructional quality from different countries and perspectives. Findings confirm existing and reveal as well relevant new relationships between several teacher characteristics and instructional quality for different grades. The results show that it is worthy to investigate teacher characteristics as predictors for instructional quality in a more detailed way. Relevance for educational practice will be presented.

Relations between heterogeneity-related teaching attitudes and motivation and instructional quality

Presenting Author:Justine Stang, TU Dortmund University, Germany; **Co-Author:**Miriam Gebauer, Institute for School Development Research, TU Dortmund University, Germany; **Co-Author:**Nele McElvany, TU Dortmund University, Germany

Classrooms become more and more heterogeneous. In this context, adequate teaching is relevant for successful learning processes. Beside the three major domains of instructional quality, which were in focus of research for the last past decades, the differentiated instruction is of particular importance. Teachers' instructional quality can be influenced by their attitudes (e.g., utility, costs) and motivation (e.g., intrinsic value, expected success) and are therefore worthy to investigate in context of heterogeneous classrooms. The study aimed to examine the relationship between teacher attitudes and motivation towards heterogeneous classrooms for differentiated instruction in math and science class. 79 elementary teachers participated in the field test of the Trends in International Mathematics and Science Study (TIMSS) 2018. Teachers were asked to answer questions concerning their attitudes, motivation and concerning general differentiated instruction as well as for high and low performing learners. Structural equation models showed for math that teachers' intrinsic value was negatively related to general differentiation. Positive relationship revealed for teachers' perceived utility, costs, intrinsic value and their differentiated instruction for low performing students as well as for teachers' perceived utility and differentiated instruction for high performing students. For science, results showed positive relationships between expected success and differentiated instruction for low and high performing students as well as between intrinsic value and differentiated instruction for high performing students. The explained variance laid between 11,0% and 43,0%. The results are discussed in terms of content and methodological issues, while implications for research and practice are presented.

Relations between teachers' professional knowledge and instructional quality in mathematics teaching

Presenting Author:Christian Bruehwiler, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Lena Hollenstein, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Benita Affolter, University of Teacher Education, St. Gallen, Switzerland

This contribution deals with the relations of teachers' professional knowledge and the quality of instruction in mathematics. It is common ground in educational research that teachers' professional knowledge is essential for effective academic learning processes. With specific regard to mathematics education, the teachers' professional knowledge include mathematics content knowledge (MCK), mathematics pedagogical content knowledge (MPCK), and general pedagogical knowledge (GPK).

Within the context of the longitudinal study *Outcomes of Teacher Education* (German: *Wirkungen der Lehrerbildung*, WiL), which is a Swiss extension of the international comparative study TEDS-M, we investigate the relationship between all three types of professional knowledge and teaching quality in primary and lower secondary education. The sample comprises 58 teachers (three years after graduation) and 1008 students. The results show significant positive correlations between GPK and instructional quality for both primary and lower secondary education. No corresponding significant effect of MCK was found. For MPCK, positive correlations with teaching quality can only be demonstrated for lower secondary level. These findings shall be discussed in terms of the importance of teachers' professional knowledge for effective academic learning processes.

Teacher motivation and changes in perceived teaching after the transition to secondary school

Presenting Author:Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:**Hanna Gaspard, University of Tübingen, Germany; **Co-Author:**Richard Goellner, University of Tübingen, Germany

In this longitudinal study, we investigated the change in students' class-level perceptions of teaching characteristics (classroom management, supportive climate, monitoring) from Grade 5 to Grade 6 after the transition to secondary school. We further examined whether teacher-reported self-efficacy and enthusiasm predicted the change in teaching characteristics across the school year when considering various covariates such as teachers' professional experience, average achievement level in class, and school type. Survey data stemmed from 1996 fifth and sixth graders of 105 classrooms who participated in two waves of the TRAIN Study (53.8% male). Multilevel latent change models revealed a significant decrease in student-perceived classroom management, supportive climate and monitoring from Grade 5 to Grade 6. Teacher-reported self-efficacy did not significantly predict the change, but teacher-reported enthusiasm for teaching positively predicted the change in student-perceived classroom management (and marginally significantly in monitoring). Consequently, teacher-reported enthusiasm buffered the decline in class-level student-perceived classroom management. The change in class-level student-perceived supportive climate from Grade 5 to Grade 6 and the level of perceived monitoring in Grade 5 were significantly negatively associated with the average level of achievement in class, indicating that in high-achieving classes students experienced a high decrease in supportive climate, and perceived their teachers as less attentive to student behavior. Teacher years of experience and school type were not significantly associated with changes in teaching characteristics. The findings are relevant for research on learning and instruction as they address the question of how teacher characteristics relate to decreases in student-perceived teaching after educational transitions.

Quality of learning environments over time: Relationships with teacher characteristics

Presenting Author:Marie-Christine Opendakker, University of Groningen, Netherlands

The quality of learning environments is important for students' learning and achievement. Teachers play an important role in creating such environments. However, it is not yet clear which teacher characteristics matter (most). In this study, the learning environment – teacher characteristics relationship was studied from a longitudinal perspective. Seventh-grade students and their teachers from the Netherlands participated in the study. Multilevel growth curve analysis revealed that the quality of learning environments (structure, clarity of instruction, classroom management, autonomy support, teacher involvement) changed during a school year and that teaching experience, in particular for male teachers, seemed to matter most in creating high quality learning environments. In addition, the feeling of being competent and effective was important for being an involved teacher and having good classroom management. Job satisfaction appeared to be relevant as well with regard to teacher's involvement, although an important part of this effect was a joint effect with feeling competent and effective. The effect of feeling competent and effective on teachers' involvement was fully a joint effect with job satisfaction. Surprisingly, teachers' motives for work and teachers' feeling of being autonomous and related did not affect the creation of high quality learning environments. However, the track level of the class did, indicating that high-track classes received more structure and clearer instruction than low-track classes. Finally, there was no evidence for differential effects of the investigated teacher characteristics over time, nor for significant interactions between teacher characteristics and the track level of class.

Session D 4

13 August 2019 08:30 - 10:00
Lecture Hall - H06 - Amazon Hörsaal
Symposium
Cognitive Science

Learning from Multiple Documents and Multiple Representations

Keywords: Cognitive skills, Comprehension of text and graphics, Experimental studies, Literacy, Multimedia learning, Quantitative methods, Reading comprehension, Technology

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Patricia A. Alexander, University of Maryland, United States

Organiser: Alexandra List, United States

Discussant: Peggy Van Meter, The Pennsylvania State University, United States

Learning in the Internet age requires students to understand, evaluate, and integrate information presented across multiple websites or documents and information presented using a variety of representations, including texts, graphics, and videos. Yet the literature on learning from multiple documents (MDs) has evolved largely independent of the literature on learning from multiple representations (MRs). The goal of this symposium is to unite these two literatures. Specifically, it brings together international experts on learning from multiple documents and from multiple representations to examine what may be similar and what may be distinct about learning from these complex stimuli. Papers in this symposium consider how students may integrate soundtrack and picture information when watching videos (Schüler & Merkt), multiple documents presented in print or digitally (Latini, Bråten, Anmarkrud, & Salmerón), text and illustrations in biology textbooks (Cromley, Kunze, Dane, & Castleberry), and historical documents with photographs and political cartoons (Cameron & Van Meter). As such, these papers consider how students integrate single and multiple sources presenting text-based and multi-representational information. Researchers in this symposium further consider the task factors (e.g., assigned goals) and strategic processes (e.g., note-taking) that may facilitate comprehension and integration. Moreover, these studies showcase the variety of methodological tools (e.g., eye-tracking, think-alouds) that may be leveraged to understand the complex processes required for the integration of MD-MRs. The symposium concludes with a discussion by Alexander, an expert on learning, who will discuss how learning from MDs and from MRs may be unified under a common conceptualization of comprehension.

Investigating Integration Processes During Learning From a Video

Presenting Author:Anne Schueler, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany

A paradigm from text comprehension research was adapted to learning from a video to test whether learners integrate the soundtrack and the picture track during processing dynamic information. In Experiment 1, we varied whether the information conveyed through the soundtrack and the picture track was always consistent (control group) or whether the information conveyed through the soundtrack was inconsistent with the picture track, at a certain point in time (inconsistent-soundtrack-group). Experiment 2 replicated Experiment 1, but added a third, additional inconsistent condition, where the picture track conveyed

inconsistent information (inconsistent-picture-track-group). For both experiments, analyses of gaze behavior during learning revealed that the control and the inconsistent groups did not differ with regard to processing consistent information. However, when inconsistent information was presented in the experimental groups, learners' gaze behaviors differed from that of the control group. These data indicate that integration processes also occur when processing dynamic materials such as videos. Interestingly, in both experiments about half of the learners in the inconsistent-soundtrack-groups falsely identified the consistent sentence as having been heard during learning, whereas about one third of learners in the inconsistent-picture-track-group falsely identified the inconsistent sentence as having been heard during learning. On the other hand, learners were able to correctly identify the picture frames they had seen during the learning phase. These data patterns can be explained by a stronger reliance of the integrated model on pictorial information.

Reading Medium and Reading Purpose in a Multiple Document Context

Presenting Author: Øistein Lamarkrud, University of Oslo, Norway; **Co-Author:** Natalia Latini, University of Oslo, Norway; **Co-Author:** Ivar Bråten, University of Oslo, Norway; **Co-Author:** Ladislao Salmeron, University of Valencia, Spain

The main aims of this study were to compare behavioral engagement and intertextual integration when students read two different documents in digital versus printed forms, as well as whether any effects of reading medium were moderated by reading purpose. Using a 3 (reading medium: digital-digital, print-print, mixed) x 2 (reading purpose: exam, pleasure) between-subjects design, a sample of 133 undergraduates was instructed to read two documents about social media either to prepare for an exam or for pleasure. Students either read both documents digitally, both in print, or one digitally and one in print (i.e., mixed). Afterwards, students answered four cross-text integration questions about the content of the documents. Behavior engagement was indicated by the time students invested in reading the documents and the length of their written responses. The results did not show any main effects of reading medium or reading purpose on any of the dependent measures (i.e., reading time, response length, and cross-document integration). However, for both reading time and response length, there were statistically significant interaction effects of reading medium with reading purpose that may provide new insights into how reading medium and reading purpose work together in affecting behavior engagement in multiple document contexts. One possible reason no effects on cross-document integration were found is that the integration task could be considered a global task requiring a broad overview rather than specific attention to detailed textual information. Finally, the results highlighted the importance of reading comprehension for both behavioral engagement and cross-document integration.

Reading Process Data and Learning Outcomes From Reading Multiple Illustrated Texts

Presenting Author: Jennifer Cromley, University of Illinois at Urbana-Champaign, United States; **Co-Author:** Andrea Kunze, University of Illinois, United States; **Co-Author:** Aygul Parpucu Dane, University of Illinois, United States; **Co-Author:** Colin Castleberry, University of Illinois, United States

Undergraduates were presented with two sets of biology materials, including both texts and captioned illustrations. Process data, including think-alouds and screen recordings of participants' attendance to different foci, were recorded. Both intra-textual (e.g., T1, T1) and inter-textual (e.g., T1, T2) navigation sequences and switches from texts to diagrams (e.g., T1, D1) were recorded and examined in relation to comprehension performance. Patterns in participants' navigation across texts and illustrations were identified. Higher performing students exhibited longer re-reading of content and more "jumps" across texts. Step-wise linear regression found inter-textual navigation, but not intra-textual navigation, to be associated with inter-textual, multi-modal comprehension.

Learning from Multiple Verbal and Visual Documents

Presenting Author: Peggy Van Meter, The Pennsylvania State University, United States; **Co-Author:** Chelsea Cameron, Penn State University, United States

Document sets include both verbal and visual representations. Multimedia research consistently demonstrates differences in how learners process text and visualizations, but multiple document research has paid little attention to this characteristic. This study extends recent research that found differences in learner processing of verbal and visual documents (Authors, 2018). Participants examined two verbal documents and four visual historical documents and recorded notes in a document matrix. After reading, participants completed question generation and recall measures. Matrix notes showed that few participants attended to the visual documents, but no associations were found between this processing and either question generation or recall.

Session D 5

13 August 2019 08:30 - 10:00

Lecture Hall - H07

Symposium

Assessment and Evaluation

Composition in school and class: What effects do peers have on students' individual development?

Keywords: Achievement, Mathematics, Motivation and emotion, Out-of-school learning, Peer interaction, Primary education, School effectiveness, Social development, Social interaction, Special education

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Marianne Schuepbach, Freie Universität Berlin, Germany

Organiser: Marianne Schuepbach, Freie Universität Berlin, Germany

Discussant: Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany

In this symposium we will look at school and class composition and its impact on individual development in academic and non-academic outcomes. Numerous previous research studies investigated the effects of group composition, focusing on a variety of factors. Up to now, however, there has been a lack of longitudinal studies. A further gap in the research is in the area of extended education, especially all-day schools, and in inclusive learning environments regarding the composition of the student body and its effects. This symposium starts at these research gaps. The first study, conducted in Flemish primary schools, examines the short and long term effects on achievement and on non-cognitive outcomes of school composition in primary education. The study explores to which degree high proportions of socially disadvantaged and/or ethnic minority children affect students' outcomes. The second and the third papers come from the same study but conducted in all-day schools in the German speaking-part of Switzerland: The second paper focuses on the outcome in mathematics and on whether there is an association between language achievement at the individual and class level and students' development in mathematics at the beginning of primary school. The third paper examines whether social-emotional development, especially internalizing behavior in peers, as a class composition effect facilitates students' internalizing behavior. The fourth paper, on a study conducted in Germany in the state of Baden-Wuerttemberg, deals with class composition effects on friendship networks of students with special educational needs in inclusive learning environments.

Short and long term effects of school composition in primary education

Presenting Author: Jan Van Damme, KU Leuven, Belgium

Using data from a Flemish longitudinal study on primary school students' learning gains (N= 6000), group composition effects (GCE) focusing on the proportion of socially disadvantaged and/or ethnic minority children (SD/EM) were examined. Also long term GCE on mathematics achievement and some non-cognitive outcomes at the age of 17 were considered. Within primary school, repeated measures multilevel analyses were performed allowing for piecewise growth curve modelling of learning gains in each grade. To study the long term effects, cross-classified multilevel models allowed to separate the effects of primary and secondary schools. Some of the results were : a) group composition effects were found relating to students' initial achievement status, indicating that – having controlled for the effects of students' individual characteristics – students' initial achievement status is lower in schools with higher proportions of disadvantaged/minority students. But almost no GCE were found on subsequent learning gains; b) we observed large differences in effectiveness amongst schools with many disadvantaged/minority pupils and also amongst high SES schools; c) there were almost no primary school composition effects on mathematics achievement and non-cognitive outcomes at the age of 17. The study points out the necessity of longitudinal research in order to make a distinction between GCE on students' initial achievement status and GCE on subsequent learning gains. The findings question the most popular explanations for GCE found in the literature, mostly relying on classroom or school level interactions among students or between students and teachers. Methodological issues and possible interpretations of the results are discussed.

Mathematics Achievement and the Association with Language Achievement in All-day Schools

Presenting Author:Marianne Schuepbach, Freie Universität Berlin, Germany; **Co-Author:**Lukas Frei, University of Bamberg, Switzerland; **Co-Author:**Benjamin von Allmen, University of Bamberg, Switzerland; **Co-Author:**Nanine Lilla, University of Bamberg, Germany; **Co-Author:**Wim Nieuwenboom, Otto Friedrich University Bamberg / FNHW Switzerland, Switzerland

In this study, we investigate: (1) whether there is an association between language achievement (reading) at the individual and (school) class level and mathematics achievement and development at the individual and class level at the beginning of primary school. Further, we will examine: (2) what other effects utilization of extended education offerings has, and (3) what differential effects there are on mathematics achievement and development at the individual and class level at the beginning of primary school depending on language achievement and utilization of extended education offerings.

We investigated these questions using data from a longitudinal study funded by the Swiss National Science Foundation that looked at 1,990 students in 118 classes and 53 schools in the German-speaking part of Switzerland. Initial results of the multilevel growth curve model show that students with higher language achievement have better mathematics achievement at the end of Grade 1. Also, classes with higher language levels have a leading edge in mathematics achievement. Students with higher language achievement also show a stronger increase in mathematics achievement from the end of Grade 1 to the end of Grade 2. On average, however, classes with low language achievement exhibit stronger development and, in this way, catch up to classes with higher language achievement, whose initial advantage becomes reduced by about half. Utilization of extended education offerings has no effect on individual mathematics achievement and development. However, there are differential effects depending on language achievement at the individual level. Mathematics development in students utilizing extended education offerings is not as strong.

Effects of Extended Education on Internalizing Behavior: Class Composition as Possible Moderator

Presenting Author:Wim Nieuwenboom, Otto Friedrich University Bamberg / FNHW Switzerland, Switzerland; **Co-Author:**Lukas Frei, University of Bamberg, Switzerland; **Co-Author:**Marianne Schuepbach, Freie Universität Berlin, Germany; **Co-Author:**Benjamin von Allmen, University of Bamberg, Switzerland

Extended education as e.g. the all-day school offers additional opportunities to develop positive relationships in a structured and supervised environment. Therefore, societal and academic expectations regarding children's socio-emotional development are high. Socio-emotional development includes the reduction or prevention of internalizing behavior. However, empirical evidence regarding beneficial effects of extended education on reducing internalizing behavior is mixed. To explore these effects as well as possible moderators, we conducted multilevel-analyses in a longitudinal sample of 1,076 students from 84 school classes in 47 all-day schools in Switzerland. Stable utilization of extended education facilitated the students' internalizing behavior, whereas the quality of the student-caregiver interaction yielded no significant effect. Moreover, the results suggest that internalizing behavior in peers facilitates the students' internalizing behavior as a class composition effect. This effect proved to be significantly stronger for those students who had a stable utilization of extended education. A possible explanation for this unexpected result may be peer contagion. Subsequent analyses display a complex pattern of cross-level interactions, indicating confounding characteristics. Consequences for future research are discussed.

Outsiders inside inclusive classes? Class composition effects on friendship networks of SEN students

Presenting Author:Katja Scharenberg, University of Education Freiburg, Germany; **Co-Author:**Sebastian Röhl, University of Education Freiburg, Germany

Studies examining the effectiveness of inclusive education found that students with special educational needs (SEN) achieved higher in inclusive than in special education schools. Beyond achievement, social participation is also considered to be an important outcome. In this regard, previous studies mostly showed a weaker social participation of students with SEN compared to their peers. As known from the field of school effectiveness research, classroom composition plays an important role for students' achievement. Yet, with regard to inclusive education, the question whether and to what extent inclusive learning environments affect social outcomes has not been empirically investigated so far. Thus, our study analyzed whether students with and without SEN differ regarding their friendship networks, whether friendship networks differ between classes and whether the social, ethnic and performance-related classroom composition can explain these differences. Our sample comprised $n=671$ students in 42 inclusive classes on lower-secondary level (Grades 5, 6 and 7) in comprehensive schools in Baden-Wuerttemberg (Germany). Applying a sociometric questionnaire (Moreno, 1967), we asked students whom they considered to be their friends in the classroom. Descriptive analyses showed that SEN students received fewer peer nominations than their classmates without SEN. Furthermore, we found significant differences in friendship networks between the classes ($ICC=.290$, p

Session D 6

13 August 2019 08:30 - 10:00

Lecture Hall - H08

Symposium

Motivational, Social and Affective Processes

Self-, Co-, and Shared Regulation: What do they look like in different contexts? Why do they matter?

Keywords: Collaborative Learning, Computer-supported collaborative learning, Conversation/ Discourse analysis, Emotion and affect, Learning Technologies, Metacognition, Motivation, Motivation and emotion, Physical Sciences, Self-regulation, Video analysis, Workplace learning

Interest group: SIG 16 - Metacognition

Chairperson: Sarah Davis, University of Victoria, Canada

Organiser: Aishah Bakhtiar, University of Victoria, Canada

Organiser: Marijn Wijga, University of Twente, Netherlands

Discussant: Simone Volet, Murdoch University, Australia

Theory suggests that productive collaboration necessitates three modes of regulation: (a) self-regulation (SRL), where learners individually take responsibility to regulate their own learning; (b) co-regulation (CoRL), where learners temporarily guide or compensate for others' or the team's regulatory trajectories; and (c) socially shared regulation (SSRL), where learners regulate together as a team toward a shared outcome (Hadwin, Järvelä, & Miller, 2018). Methodologically, however, these three modes of regulation can be difficult to detect and decipher when they emerge in situ. Beyond detecting regulation, the field is challenged with ways to distinguish adaptive from maladaptive regulation, as indicators of a "successful" regulation are unclear. This symposium brings together researchers using a variety of data sources to examine self-, co-, and shared regulation in different types of collaborative contexts. A range of research will be presented, including: video analysis of modes of regulation in a workplace learning context, chat data analysis of groups regulating motivation, physiological data analysis of groups' (mal)adaptive regulation, and multi-modal analysis of shared emotion regulation on team outcomes. Three questions will guide this symposium discussions: (a) What are the methods for detecting self-, co-, and shared-regulation? (b) What are methods for distinguishing adaptive from maladaptive regulation? (c) What types of outcomes should we be expecting as a result of successful regulation?

Social Regulation at the Workplace: Different Modes of Regulation and Variation in Quality

Presenting Author:Marijn Wijga, University of Twente, Netherlands; **Co-Author:**Maaike Endedijk, University of Twente, Netherlands; **Co-Author:**Bernard Veldkamp, University of Twente, Netherlands

In the field of workplace learning, there is a consensus that self-regulation is a key factor in enhancing learning. However, learning at the workplace is often not an individual process, but particularly takes place in interaction. The idea that regulation during collaboration addresses more than self-regulation of individual team members has shifted the attention to the conceptualization of social modes of regulation. These modes of regulation have so far only been applied in formal education contexts and are fairly left unexplored in workplace settings. Therefore, this research will focus on exploring the different modes of regulation taking place during teamwork and we aim to create insight into how to measure and analyze these processes in the complex setting of the workplace. In addition, by focusing on (mal)adaptive patterns we attempt to examine variations in the quality of regulation episodes. Data include videotaped team meetings in the context of agile ICT organizations. Results show that only a small amount of the regulation episodes shows adaptive regulation, indicating that teams struggle to adaptively respond to challenges they face. As adaptive regulation is essential to complete the full cycle of regulation and to learn from previous

activities, further research could focus on interventions to increase adaptive behavior of teams. In addition, social network analysis measures show clear differences between socially shared regulation and self- or co-regulation episodes highlighting the value of a social network perspective in empirically disentangling the different modes of regulation.

Dynamic interplay between regulatory modes when regulating motivation in collaboration

Presenting Author: Allyson Hadwin, University of Victoria, Canada; **Co-Author:** Aishah Bakhtiar, University of Victoria, Canada; **Co-Author:** Mariel Miller, University of Victoria, Canada; **Co-Author:** Annie Wu, University of Victoria, Canada

Regulation in collaborative learning involves individuals self-regulating, the group sharing the regulation, and individuals or the group temporarily support to promote successful uptake toward self-regulation or shared regulation. Although there is an increasing number of research describing the occurrence of the three regulation modes, it was not clear how they dynamically interact particularly when groups are taking control of motivation in collaboration. The purpose of this paper is to examine the dynamic interplay between different modes of regulation in a motivationally functional and a motivationally dysfunctional group. An important contribution of this paper lies in its contemporary methodological approach in uncovering the role co-regulation plays in promoting self- and shared-regulation over time.

Identifying sequences of adaptive and maladaptive regulation in collaboration using multimodal data

Presenting Author: Jonna Malmberg, University of Oulu, Finland; **Co-Author:** Márta Sobocinski, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Muhterem Dindar, University of Oulu, Finland; **Co-Author:** Antti Isosalo, University of Oulu, Finland

This study explores sequences of events that indicate adaptive regulation or maladaptive behavior in collaborative learning. This is achieved by looking at three different dimensions of monitoring (target, valence, and phase) and what follows after these events. Since the focus is on group level monitoring, we also explored how these sequences of regulation are reflected in group level physiological state transitions. Participants were three groups of three members each, participating in the collaborative exam of a high school advanced physics course. The analysis revealed how three dimensions of monitoring (valence, target and phase), as well as the reaction that followed them can be used to identify critical moments when regulation is needed, as well as to distinguish between different types of adaptive regulation and maladaptive behavior sequences following these moments. The results showed that the distribution of "on-track", adaptive and maladaptive sequences differed between the groups, and a correlation analysis showed that physiological state transitions are negatively correlated with controlling (adaptive) regulation sequences.

Interdependent Emotion Regulation Modes: Similarities between Self-, Co- and Shared Regulation

Presenting Author: Maedeh Kazemitabar, McGill University, Iran; **Co-Author:** Susanne Lajoie, McGill University, Canada

This study examines international physics teams that competed at a 24hr international academic programming competition (i.e., hackathon). Self, co- and socially-shared emotion regulation strategies and their effects on team performance were examined using multimodal data (team interaction videos, interview and questionnaire data) in 17 teams of 2-5 members (N=48). Using a mixed method exploratory analysis, we identified types of self, co- and shared emotion regulation strategies teams applied in reaction to the challenges they faced. Findings revealed isomorphic patterns between the three modes of emotion regulation. Rooted in the self-regulation of emotions literature, we developed a comprehensive model of team emotion regulation, classifying 26 unique emotion regulation strategies into five major categories applicable for self, co- and socially-shared emotion regulation. This model extends the emotion regulation model for individuals (Gross, 1998 & 2015) and serves as an important contribution to the field of collaborative learning. Findings have implications for enhancing team performance in teams with challenges and breakdowns by focusing on emotion regulation strategies that can lead to challenge resolution in complex collaborative settings.

Session D 7

13 August 2019 08:30 - 10:00

Lecture Hall - H05

Symposium

Cognitive Science

Dynamic relations: self-regulation and early academic skills in young children across Europe

Keywords: Achievement, Early childhood education, Intelligence, Quantitative methods, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Catherine Gunzenhauser, Leipzig University, Germany

Organiser: Catherine Gunzenhauser, Leipzig University, Germany

Organiser: Dieuwert ten Braak, University of Stavanger, Norway

Discussant: Joana Cadima, University of Porto, Portugal

Self-regulation is strongly related to academic achievement in preschool and beyond, and an important indicator of school readiness. However, the direction and strength of associations between self-regulation and (pre-)academic skills remain to be fully understood. While many researchers view self-regulation as a prerequisite for academic achievement, there is also evidence for bidirectional relations. In addition, there is an ongoing debate regarding the potential overlap between executive functioning (the cognitive component of self-regulation) and general intelligence, the latter being one of the most established predictors of academic achievement. Disentangling the relations between self-regulation, general intelligence, and academic achievement is crucial in order to identify starting points for boosting children's learning. The proposed symposium addresses these issues from a European perspective. Longitudinal studies investigating self-regulation in preschool and elementary students from Kosovo, Norway, Portugal and Finland will be presented. The first paper (Uka et al.) examines bidirectional influences in the development of executive functioning and general intelligence. The second paper (ten Braak et al.) investigates the mediating role of self-regulation in the relationship between early mathematics and later academic achievement. The third and fourth paper (Guedes et al.; Pakarinen et al.) model reciprocal influences between aspects of self-regulation and language and mathematics skills. The discussion will outline recommendations for next steps concerning research and policy efforts aimed at supporting children's school readiness to reduce early inequalities.

Testing a Bidirectional Model of Executive Functions and Fluid Intelligence Across Early Childhood

Presenting Author: Fitim Uka, University of Prishtina, Kosovo; **Co-Author:** Catherine Gunzenhauser, Leipzig University, Germany; **Co-Author:** Ross Larsen, Brigham Young University, United States; **Co-Author:** Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates

Despite the importance of executive functions (EFs) and fluid intelligence for many everyday tasks, the evidence regarding associations between the two constructs remains limited and mixed. The present study tested a bidirectional model between various components of EFs (inhibitory control, attention shifting and working memory) and fluid intelligence over the preschool period. A sample of 150 preschool children from Kosovo (51% girls) was tested on measures of EFs and fluid intelligence across three measurement waves. Autoregressive cross-lagged path models were used to provide robust tests of reciprocal effects. Results showed within-domain stability across time, with prior EFs and fluid intelligence predicting later competence in the same domain. In addition, our results did not support the existence of a consistent pattern of within-time associations between EFs and fluid intelligence across all time points. However, initial evidence was found for a bidirectional relation between inhibitory control and fluid intelligence across time, but not for the other components under investigation (i.e., working memory and attention shifting). Findings add to existing evidence that EFs and fluid intelligence are separate but interrelated constructs. However, relationships seem to differ depending on the component of EFs investigated, suggesting a complex pattern of relations between constructs. The findings have educational implications as they could be used to update the curriculum of early education in Kosovo, which is currently focused on academic skills while neglecting the importance of EFs.

How self-regulation mediates the relation between early math and later academic achievement

Presenting Author:Dieuwer ten Braak, University of Stavanger, Norway; **Co-Author:**Ragnhild Lenes, University of Stavanger, Norway; **Co-Author:**Ingunn Storksen, University of Stavanger, Norway

The stable and robust association between young children's early mathematical proficiency and later academic achievement is well established. Less is known about the mechanisms through which early math skills may contribute to later math and reading achievement. The present study investigated how two aspects of self-regulation (behavioral regulation and working memory) mediated the relationship between early math and later math and reading achievement. Data in this longitudinal study were collected in Norwegian kindergartens (N= 243, ages 6-7), one year later in first grade (N =240), and four years later when the children were in fifth grade (N= 160). Using structural equation modeling techniques a parallel multiple mediator model was estimated. Background variables (socioeconomic status, age and gender), previous skills, and mediating effects of mathematics and other academic skills in first grade were controlled for. Results showed that both behavioral regulation and working memory significantly mediated the effect of early mathematics on later math achievement, and that behavioral regulation, but not working memory, significantly mediated the effect on later reading achievement. Findings suggest that a focus on high-quality mathematics education in kindergarten may have the dual benefit of securing two pathways to children's academic achievement in elementary school: through an accumulative development of math skills and through the promotion of self-regulatory processes.

Cross-domain effects between self-regulation and vocabulary skills across toddlerhood

Presenting Author:Joana Cadima, University of Porto, Portugal; **Co-Author:**Carolina Guedes, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal; **Co-Author:**Teresa Aguiar, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Cecilia Aguiar, ISCTE - Instituto Universitário de Lisboa, Portugal; **Co-Author:**Clara Barata, Faculty of Psychology and Educational Sciences of the University of Porto, Portugal

Self-regulation skills have been shown to be essential for children's adjustment and success in school. Although some studies have linked self-regulation and vocabulary skills in preschool, the interinfluences between these two developmental processes are still unclear, especially across toddlerhood, when intra-individual variation in such skills is high. The current study aims to address this gap by examining the bidirectional associations between vocabulary and self-regulation across three time points. Study participants were 268 toddlers (Age at T1 = 30 months; 48% girls). Self-regulation was assessed via a set of self-regulation tasks and vocabulary via one direct measure. Results showed that vocabulary skills predicted later self-regulation skills, suggesting its crucial role on self-regulation across toddlerhood. Findings from the current study will be discussed in light of its theoretical and practical implications.

Bidirectional Associations between Behavioral Regulation and Pre-literacy Skills in Preschoolers

Presenting Author:Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates

The present study examined bidirectional associations between children's behavioral regulation and language and pre-literacy skills across the preschool year. Participants were 441 Finnish children (6-year-olds; 212 boys) and their teachers. Teachers rated children's behavioral regulation in the autumn and again in spring, using the Multisource Assessment of Social Competence Scale (MASCS), which produced sum scores for impulsivity and disruptiveness. Children were tested by trained investigators on their pre-literacy skills in the autumn and spring, and in the spring also on their receptive vocabulary. Parental education, child's age and time elapsed between the measurement points were used as control variables. The gender differences in the reciprocal associations were also investigated. The bidirectional models best described the data. The results further showed that associations between behavioral regulation and pre-literacy skills varied between boys and girls. For boys, higher pre-literacy skills were related to lower disruptiveness and impulsivity, whereas for girls, higher disruptiveness predicted lower pre-literacy skills. The findings highlight the reciprocal associations between behavioral regulation and pre-literacy skills and emphasize the importance of promoting children's overall development during the preschool year.

Session D 8

13 August 2019 08:30 - 10:00

Lecture Hall - H09

Symposium

Understanding Fraction Magnitude – Learning to Process Fraction Magnitude

Keywords: Assessment methods and tools, Cognitive development, Cognitive skills, Conceptual change, Mathematics, Multimedia learning, Neuroscience, Numeracy, Quantitative methods

Interest group:

Chairperson: Andreas Obersteiner, University of Education Freiburg , Germany

Organiser: Andreas Obersteiner, University of Education Freiburg , Germany

Organiser: Wim Van Dooren, KU LEUVEN, Belgium

Discussant: Xenia Vamvakoussi, University of Ioannina, Greece

Many children (and even adults) struggle with understanding fractions. They struggle particularly when problems require processing a fraction symbol as one numerical magnitude (e.g., $\frac{3}{7}$ as 0.43, or as a little less than a half) rather than as two separate numbers (3 and 7). Although studies have documented typical mistakes people make in such problems, we know less about the cognitive mechanisms that underlie more and less successful processing of fraction magnitude. This is problematic because the literature suggests that fraction magnitude is key for understanding fraction concepts, which is in turn important for further mathematical development. A better understanding of fraction magnitude processing may help us understand the obstacles that learners face, and develop efficient learning and teaching tools. This double symposium addresses recent research on how people process fraction magnitude. While in part I, studies address the cognitive mechanisms of fraction magnitude processing, this second part focuses on how these processes may change through training and learning. The symposium begins with a theoretical paper that frames the symposium, considering fraction learning as the reorganization of existing knowledge structures. The other three papers use empirical methods to assess, respectively, how a computerized tool can help assessing and leveraging learners' intuitions of fraction magnitude, how individuals at different ages differ in processing fraction magnitudes represented in different formats, and how training of fraction magnitude processing affects brain activation. In combination with the first part of this symposium, we provide a coherent set of papers relevant for theory and practice of learning of fractions.

Constructing Fraction Concepts as Reorganization of Whole Number Concepts

Presenting Author:Ron Tzur, University of Colorado Denver, United States

I present a stance on the construction (learning) of fraction concepts that stresses their emergence through reorganization of whole number concepts. Contrasted with a natural number bias (NNB) stance, the reorganization stance includes particular constructs (units, operations) for articulating common conceptual foundations of whole numbers and fractions, as well as a model of the mental processes and stages involved in such reorganization. I discuss how a reorganization stance avoids issues (three facets) pertaining to NNB, and the influence of researchers' stance on their interpretations of empirical evidence and thus also on recommendations for educational practice (particularly – the need to shift from "part-of-whole" to fractions as multiplicative relationships).

Assessing and teaching intuitive fraction magnitude sense using touchscreen devices

Presenting Author:Frank Reinhold, Technical University of Munich, Germany; **Co-Author:**Stefan Hoch, Technical University of Munich, Germany; **Co-Author:**Bernhard Werner, Technical University of Munich, Germany; **Co-Author:**Jürgen Richter-Gebert, Technical University of Munich, Germany; **Co-Author:**Kristina Reiss, Technische Universität München (TUM), Germany

Reasoning about fractions as numerical magnitudes can be considered as an intuitive process, shifting instantaneously from a representation of two distinct numbers to a continuous representation. Both assessing and supporting of students' intuitive fraction magnitude sense is challenging because problems often encourage activation of partitioning and counting schemes rather than magnitude sense. We therefore present a digital assessment tool using continuous

diagrams on touchscreen devices: students are asked to represent fractions in continuous circle or tape diagrams by dragging a blue segment of either circle or tape with their fingers. We evaluated our assessment tool with data from a larger fraction project. 199 sixth grade students were asked to mark 16 fractions on both continuous diagrams while time on task was measured. On average, students took 8.66 seconds to solve the items. A linear mixed model for time on task showed that of all item parameters and student parameters, only task type (i.e., circle or tape) had a significant effect—with students requiring 2.53 seconds more to solve items on the circle diagram. In addition, the random effect for items was rather small ($Var=0.26$). Therefore, we argue that students did not inevitably look for fraction-specific characteristics but rather answered based on their—not necessarily elaborated—intuitive fraction magnitude sense. Hence, our digital assessment seems suitable for testing intuitive fraction magnitude sense in sixth grade students. We suggest that our tool could also be utilized as a learning environment to improve students' intuitive fraction magnitude sense when feedback is implemented.

Perceptions of Rational Number Magnitudes

Presenting Author:Percival Matthews, University of Wisconsin - Madison, United States; **Co-Author:**Edward Hubbard, University of Wisconsin-Madison, United States

Knowledge of rational numbers – particularly their magnitudes – is critical for mathematical literacy and academic success. However, despite considerable research efforts, rational numbers present perennial difficulties for a large number of learners. These difficulties have led some to posit that rational numbers are not a natural fit for human intuition. In this paper, we examine human processing of both nonsymbolic (i.e., ratios composed of line lengths) and symbolic instantiations of rational number magnitudes. We present empirical evidence suggesting similar performance across three age cohorts (2nd-graders, 5th-graders, and adults), and present perceptual learning tools that may help leverage perceptual intuitions to improve understanding of symbolic number magnitudes. We suggest that attending to this perceptually-based sensitivity can inform existing theory and help provide a basis for the design of more effective instruction on rational number concepts.

Training induced modulation of brain activation during fraction magnitude processing

Presenting Author:Korbinian Moeller, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Silke Maria Bieck, LEAD Graduate School, Germany; **Co-Author:**Johannes Blöchle, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Manuel Ninaus, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Kristian Kiili, Tampere University, Finland; **Co-Author:**Julia Bahn Müller, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Elise Klein, Leibniz-Institut für Wissensmedien (IWM), Germany

Understanding proportions involves the processing of ratios, such as fractions, and is known to be difficult for schoolchildren and adults alike. In order to examine the neuro-functional correlates of fraction learning, behavioral performance and neural correlates were measured before and after a five-day number line estimation training aimed at improving participants' conceptual understanding of fraction magnitude. Measures included symbolic fraction and non-symbolic proportion magnitude comparison tasks and a task in which symbolic fraction magnitudes had to be matched with non-symbolic line ratios. Improvement from pre- to post-training performance were observed for all three tasks. Changes in brain activation patterns were present in frontoparietal regions commonly associated with number magnitude processing. Importantly, neural activation associated with overall numerical distance between to-be compared symbolic fractions increased significantly through the training, indicating neurofunctional plasticity in fraction learning.

Session D 9

13 August 2019 08:30 - 10:00

Seminar Room - S01

Single Paper

Instructional Design, Learning and Instructional Technology

Computer-assisted Learning

Keywords: Comprehension of text and graphics, Computer-assisted learning, Educational Psychology, Experimental studies, Instructional design, Language (Foreign and second), Learning and developmental difficulties, Learning disabilities, Multimedia learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes

Chairperson: Helen Jossberger, University of Regensburg, Germany

Animation improve Highway Code Rules learning in deaf candidates

Keywords: Comprehension of text and graphics, Computer-assisted learning, Experimental studies, Learning disabilities

Presenting Author:Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Sebastien Laurent, IFSTTAR, France; **Co-Author:**Stéphane Argon, University of Dijon, LEAD-CNRS, France; **Co-Author:**Laurence Paire-Ficout, IFSTTAR, France

Research on animations in multimedia learning of dynamic processes has been focused on school-type educational purposes, and not on situations outside of schools. The present study tested the potential benefit of using dynamic visualization in learning Highway Code Rules, for candidates preparing the theoretical part of driving license. Conventional learning material is based on multimedia static material including written instructions and questions, with single "photo-realistic" pictures of road scenes which do not allow to easily infer the dynamism required to estimate distance and time. We investigated the effectiveness of animated presentations compared to their static counterparts in a decision making task about traffic rules. The hypothesis was that animation might improve the accuracy of decision, especially in deaf candidates who may have degraded temporal skills; For them, dynamic presentation could act a compensator tool. Four types of driving situations (overtaking, insertion on roundabout, insertion on highway and crossing an intersection) were modeled with 3D real time software. Half of the items were presented in animated format, the other half were presented in sequential-static format. Items were also either "simple" (antagonist vehicle was far or close) or complex (antagonist vehicle was intermediate between far and close). Across 32 items, participants were asked to decide whether they could insert, overtake or cross an intersection. Correct answers and decision times were recorded. Animation format was superior to sequential-static format in the decision-making task. The benefit of the animated presentation was higher in the deaf group than in the hearing group.

Wait a second! Learning from multiple choice questions with an opportunity for recall

Keywords: Computer-assisted learning, Experimental studies, Instructional design, Language (Foreign and second)

Presenting Author:Gesa van den Broek, Utrecht University, Netherlands; **Co-Author:**Liesbeth Kester, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Multiple-choice (*mc*) questions are popular in educational software because they can be scored automatically and are compatible with many input devices (e.g., touch screens). Answering *mc*-questions creates a beneficial opportunity for retrieval practice, especially when learners must retrieve knowledge from memory to evaluate plausible answer alternatives (Little & Bjork, 2015). However, retention is impaired when learners easily recognize the correct answer amongst implausible alternatives (e.g., Little & Bjork, 2015), and creating good, plausible answer alternatives is time-consuming. Therefore, we tested an alternative approach to make *mc*-practice more beneficial: by presenting the stem of the question but delaying the appearance of the answer options, we added an opportunity for recall. In an online within-subjects experiment ($N=52$), adults studied 20 pseudoword-translation pairs (e.g., kugutu=water) and then practiced with either standard *mc*-questions (*standard-MCQ*) or stepwise *mc*-questions (*stepwise-MCQ*), with feedback. In standard-MCQs, pseudowords were presented with three answer alternatives. In stepwise-MCQs, the pseudoword was shown for 4 seconds before the alternatives appeared. Stepwise-MCQs were expected to enhance learning because participants could (try to) recall the translation before being cued with answer options. However, there were no differences in learning outcomes on final tests three days after practice. Thus, an opportunity for prior recall did not enhance learning from MCQs. Possibly, the plausible answer options in the present study induced knowledge retrieval from memory also in standard-MCQ. Therefore, Experiment 2 (currently conducted) tests effects of stepwise-MCQs when answer alternatives are less plausible and the correct answer is salient. Results will be presented at the conference.

Multimedia learning in dyslexia: an eye tracking study on learning processes and outcomes

Keywords: Comprehension of text and graphics, Computer-assisted learning, Learning and developmental difficulties, Multimedia learning

Presenting Author: Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands; **Co-Author:** Eliane Segers, Radboud University Nijmegen / University of Twente, Netherlands; **Co-Author:** Ludo Verhoeven, Radboud University Nijmegen, Netherlands

Students with dyslexia are often provided with extra audio to support their reading, creating a multimedia environment. Presenting identical information in different multimedia forms simultaneously (written text with narration) is considered to be redundant. Studies examining this effect show, however, ambiguous results, also in students with dyslexia. The ambiguous results on learning outcome may be due to differences in the processing of the multimedia materials. Therefore, it was examined to what extent adding audio changes learning processes and outcomes in students with and without dyslexia and how these processes explain learning outcomes. To do so, 86 university students (42 dyslexia) were presented with two user-paced multimedia lessons (text-picture and text-audio-picture) in a within-subject design with retention and transfer post-tests. An SMI RED-500 eye-tracker was used to capture eye-movements as a way to examine learning processes. Areas of interest (text vs. picture), number of fixations, and switches were compared between the conditions and linked to learning outcomes. There were no differences between students with and without dyslexia. We found redundancy effects on transfer knowledge. When audio was added (and thus redundant), students had longer study times, more focussing on the picture, and more transitions. Differences in processing multimedia materials (examining the pictures), accounted for retention knowledge, not transfer knowledge. We can conclude that adding audio changes learning processes and outcomes, similar in students with and without dyslexia, and that these learning processes explain learning outcomes to a certain extent.

Perceptual challenges for learning from animations in educational multimedia

Keywords: Comprehension of text and graphics, Educational Psychology, Instructional design, Multimedia learning

Presenting Author: Richard Lowe, Curtin University, Australia; **Co-Author:** Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:** Laurie Porte, University of Burgundy, France

Set in the theoretical framework of the Animation Processing Model, this paper considers learning from the type of animated displays now widely used in multimedia educational resources. In particular, it addresses the hitherto under-rated role of visual perception in learner processing of these often challenging dynamic stimuli. A primary focus of multimedia research to date has been on the combined effects of different media rather than on how learners process the individual components (typically text and pictures) comprising these combinations. However, there are also important issues to consider regarding how well learners are equipped to deal with the way animations are currently designed and used. This paper is a response to findings from recent research on (i) individual differences in the ability to process dynamic stimuli effectively, and (ii) a novel, principled approach for designing more educationally effective animations. In both these investigations, aspects of visual perception were implicated as key influences on learning success. In one case, a clear correlation was found between dynamic spatial ability and learning from a complex animation. In another case, it was concluded that detailed analysis of the subject matter regarding its likely perceptual demands should be undertaken when implementing new approaches to animation design. Work in progress arising from these two cases will be discussed with respect to its theoretical significance and the possible ramifications for how animated components of multimedia learning resources should be designed and supported to achieve optimal educational outcomes.

Session D 10

13 August 2019 08:30 - 10:00

Seminar Room - S10

Single Paper

Assessment and Evaluation, Higher Education, Teaching and Teacher Education

Competencies in Higher Education

Keywords: Argumentation, Assessment methods and tools, Competencies, Comprehension of text and graphics, Higher education, Pre-service teacher education, Quasi-experimental research, Self-efficacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Francisco Peixoto, Portugal

Measuring Prospective Teachers' Non-Cognitive Characteristics Using Multiple Mini Interviews

Keywords: Assessment methods and tools, Competencies, Higher education, Pre-service teacher education

Presenting Author: Riitta-Leena Metsapelto, University of Jyväskylä, Finland; **Co-Author:** Jukka Utriainen, University of Jyväskylä, Finland; **Co-Author:** Joonas Muotka, University of Jyväskylä, Finland; **Co-Author:** Anna-Maija Poikkeus, University of Jyväskylä, Finland

This paper examines applicant and interviewer perceptions and feasibility of the Multiple Mini Interview (MMI; Eva et al., 2004) applied in selecting students into initial teacher education programs in Finland. In an MMI, applicants move through a number of stations responding to questions and discussing scenarios while being rated by an examiner using a standardized scoring scheme. Strong psychometric properties of MMI give impetus to apply this method in the field of education. The main goal of this paper is to investigate applicant and interviewer perceptions of the MMI (i.e., fairness, face and predictive validity, and feasibility) in prospective teacher selections. In addition, we used intra-class correlations (ICC) to investigate how much of the total variation in applicant scores in each station would be explained by the effect of the interviewer. Participants of the study comprised of applicants seeking entry into class teacher and/or special education teacher programs ($N=304$) and interviewers conducting the MMI ($N=28$). The findings showed that the MMI was well-received by applicants and interviewers; they considered it as a fair and relatively valid and feasible selection tool. Interviewer effects were mostly small in magnitude, indicating that most of the measured variance was attributable to the individual differences between applicants. The findings provide support for the use of the MMI in selecting students into initial teacher education programs.

Clumping of peer-assessment grades: Is comparative judgement an alternative for rubrics rating?

Keywords: Assessment methods and tools, Competencies, Higher education, Quasi-experimental research

Presenting Author: Liesje Coertjens, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Quentin Hody, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Florence Van Meenen, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Marie-Claire Van Nes, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Franck Verschuren, Université catholique de Louvain (UCL), Belgium

In medicine, being able to assess work of colleagues is considered an important skill. Consequently, peer-assessment is increasingly relied upon during medical education. Yet, the correlation between peer and teacher marks in medical education settings is often low and in some peer-assessments a clumping of grades at the highest end of the scale is noted. Such clumping was evident in our study as well. The first cohort of second bachelor students used rubrics rating to assess the quality of five one-page essays on a pollutant. 86% of students received 43 out of 45 or more. The limited informative value of these grades was an incentive to examine possible alternatives for the rubrics rating method applied. The second cohort of students used comparative judgement to assess their peers' essays on a pollutant. Students completed 6 comparisons of essays by indicating each time the better one. Results showed that, when using comparative judgement, students can differentiate quality and that the rank order of essays obtained is reliable. Future analyses will detail on the convergent validity by examining the correlations between the teacher marks and the rank order as generated by the peers.

Students' presentation self-efficacy and its relations with teaching behavior

Keywords: Assessment methods and tools, Competencies, Higher education, Self-efficacy

Presenting Author: Marco Schickel, Berlin School of Economics and Law, Germany; **Co-Author:** Tobias Ringeisen, Berlin School of Economics and Law, Germany

By means of two studies, the presentation self-efficacy scale (SEPM-P) was validated in relation to teaching behaviors. In study 1, factorial and construct validity of the SEPM-P were examined. 1528 university students completed the SEPM-P along with other self-report measures assessing course-related variables and

teaching behaviors of lecturers during courses which aimed at fostering presentation skills. A cross-sectional survey was realized as part of the regular course evaluation at the end of the semester. Due to a privacy policy, demographic data could not be collected. Replicating previous research, confirmatory factor analysis corroborated a one-factor model for the 8 presentation self-efficacy items. Positive correlations between the SEPM-P and selected teaching behaviors (autonomy support, steering discussion, explaining clearly, providing good course materials) indicated sufficient construct validity. In study 2, criterion validity was determined by means of latent change score modeling. 158 students (Mage = 24.40, SD = 4.04; 61% females) took part in a university course to foster presentation skills and completed the SEPM-P scale at the beginning and the end of the semester. In addition, students assessed their lecturers' teaching behaviors half-way during the semester. Presentation self-efficacy increased significantly over time. The increase was positively related to selected teaching behaviors, in particular feedback and providing good course materials. Unexpectedly, only initial levels, but not the increase in presentation self-efficacy, were positively associated with the performance in a practical presentation exam at the end of the course. Across both studies, the SEPM-P subscale showed high reliability, with McDonald's omega > .80

Fostering the Comprehension and Evaluation of Informal Scientific Arguments

Keywords: Argumentation, Competencies, Comprehension of text and graphics, Higher education

Presenting Author:Hannes Muenchow, University of Würzburg, Germany; **Co-Author:**Tobias Richter, University of Würzburg, Germany; **Co-Author:**Sebastian Schmid, University of Regensburg, Germany

The ability to comprehend and evaluate informal arguments is important for making sense of scientific texts and scientific reasoning. Nevertheless, university students often lack the skills of decoding the functional structure and judging the plausibility of informal arguments. Results from a previous study show that these skills can be improved by computerized training interventions. However, no clear effect was found on follow-up measures, indicating the need for retraining. The aim of the present study was to further evaluate the effectiveness of the training interventions using a pre-post-test design with a follow-up four weeks later and short booster training sessions before the follow-up tests. The trainings aim at undergraduate students in the human and social sciences and consist of educational units accompanied by exercises and practicing tasks. In this study, 62 university students at the beginning of their studies were randomly assigned to participate either in an argument structure training, in an argument evaluation training, or in a speed-reading training as a control condition. The skills of decoding the functional structure and judging the plausibility of (informal) arguments were measured one week before the training (pre), 15 minutes after the training (post) and four weeks after the initial trainings (follow-up). Results indicate that students in both training conditions outperformed those in the control condition in the post-test after the training. Furthermore, the booster training in the argument structure condition additionally resulted in stable training effects on follow-up measures.

Session D 11

13 August 2019 08:30 - 10:00

Seminar Room - S09

Single Paper

Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Reading Comprehension

Keywords: Assessment methods and tools, Comprehension of text and graphics, Experimental studies, Instructional design, Literacy, Mathematics, Reading comprehension, Reasoning, Teaching/instruction

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design

Chairperson: Ariane S. Willems, University of Goettingen, Germany

Interleaving promotes coherence construction while learning with expository texts

Keywords: Comprehension of text and graphics, Instructional design, Reading comprehension, Reasoning

Presenting Author:Roman Abel, University of Kassel, Germany; **Co-Author:**Matthias Mai, Leibniz University of Hannover, Germany; **Co-Author:**Martin Haenze, University of Kassel, Germany

Learning natural categories with expository texts encompasses divergent learning goals, such as construction of a coherent mental representation and comparison across objects. We address the question of how information in text should be sequenced to support learning of natural categories. We conducted a 2*2 between-subjects factorial experiment with 194 8th and 9th grade-students. The expository text we used depicted six types of whales, which differed with reference to six characteristics. We manipulated the sequence in which information units were presented by their proximity and accessibility. Proximity: Whales were presented blocked by their characteristics vs. characteristics were interleaved across whales; interleaving enriched the contrast between the whales but disrupted the cohesion of presentation. Accessibility: The sequence in which information units were presented varied across the paragraphs vs. the presentation was invariably sequenced. Basing on the assumption from the research on text comprehension that proximately placed information is more likely to be linked by learners, we expected blocking to support coherence construction and interleaving to support comparative reasoning. Further, we expected the invariable sequence to reduce the demands of linking distant information. Results reveal that learners make profound comparisons when interleaved texts are invariably sequenced. Remarkably, interleaving was found to support both learning goals – comparative reasoning and coherence construction. On the one hand, the discriminative contrast may have animated learners to discover the underlying regularities across whales' characteristics. On the other hand, discovering regularities set implicit demands on learners to make elaborated comparisons between objects.

Does Reading Comprehension Affect German and Taiwanese Students' Mathematical Problem Solving?

Keywords: Experimental studies, Mathematics, Reading comprehension, Teaching/instruction

Presenting Author:Janina Krawitz, University of Münster, Germany; **Co-Author:**Stanislaw Schukajlow, University of Münster, Germany; **Co-Author:**Yu-Ping Chang, National Taiwan Normal University, Taiwan; **Co-Author:**Kai-Lin Yang, National Taiwan Normal University, Taiwan

A real-world situation, which is typically presented in text form, has to be translated into a mathematical model in order to be used to solve a mathematical modelling problem. To complete the translation process, the information contained in the real-world situation has to be understood, structured, and simplified before a mathematical model can be set up. Therefore, reading comprehension can be considered an essential precondition for solving modelling problems. Hence, we conducted an experimental study with 498 ninth-graders – including 201 German and 297 Taiwanese students – to address the question of whether providing students with reading comprehension prompts leads to better modelling performance. We further analyzed whether German and Taiwanese students differ in their modelling performance and whether providing students with reading prompts has a different impact on the modelling performance of German and Taiwanese students. We decided to compare students from these two countries because they potentially differ in their experience with modelling problems, their reading comprehension, and their intra-mathematical performance. Providing students with reading prompts could lead to a different effect on the modelling performances of the students from these two different countries. This would indicate country-specific difficulties in solving modelling problems. We found that German students showed better modelling performance than Taiwanese students. However, the use of reading prompts had no impact on students' modelling performance, and the effect of using reading comprehension prompts did not differ between the two countries. Implications for future research are discussed.

Testing the Validity of Score Interpretations of Standardized Reading Comprehension Tests

Keywords: Assessment methods and tools, Experimental studies, Literacy, Reading comprehension

Presenting Author:Daniel Dinsmore, University of North Florida, United States; **Co-Author:**John White, University of North Florida, United States

This study examined whether standardized tests of reading comprehension yield valid score interpretations with regard to the complex task of reading and understanding a text. Forty five undergraduate students (with additional data collection underway) answered questions about two passages, one for which they had actually read the text and another for which no passage was provided. Results indicated that for one passage there was little difference between the test performance for those who read the text and those who did not. For the second text, average scores were slightly better for those who read the text; however,

there were marked variations between item difficulties across the groups, with two items being answered better by those who had not read the text. This study provides additional evidence that multiple choice standardized tests of reading lack the ability to measure actual comprehension, much less the complex processes involved in reading, and it serves as a catalyst for more critical examinations of standardized reading comprehension measures.

Session D 12

13 August 2019 08:30 - 10:00

Seminar Room - S04

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Learning and Social Interaction

Argumentation

Keywords: Argumentation, Assessment methods and tools, Attitudes and beliefs, Citizenship education, Computer-supported collaborative learning, Conversation/ Discourse analysis, Distributed cognition, Educational technology, Language (Foreign and second), Primary education, Writing/Literacy

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Malin Tväråna, Stockholm University, Sweden

Measuring argumentation skills of upper-elementary students

Keywords: Argumentation, Assessment methods and tools, Primary education, Writing/Literacy

Presenting Author: Alina Reznitskaya, Montclair State University, United States; **Co-Author:** Ian A.G. Wilkinson, University of Auckland, New Zealand

We describe a systematic process of developing two measures designed to assess the ability of upper elementary school students to construct and comprehend arguments. The resulting measures represent open-ended, scenario-based tasks, called *Writing Argument* and *Reading Argument*. We discuss the rationale and theoretical framework for these measures, describe pilot and validation studies, and present the findings to support their reliability, validity, and practicality. Our results showed that both measures had acceptable inter-rater reliability. The correlations among *Writing Argument*, *Reading Argument* and an established reading comprehension test was low-to-moderate, which is a finding that requires further investigation. The performance on both measures was not associated with gender or ethnicity of the student. Teachers found both measures to be pedagogically effective. Although some teachers initially struggled with learning how to use the scoring rubrics, they generally found the scoring for both tasks to be informative for their practice.

Epistemic cognition in argumentation. Taking a walk on the interpsychological plane

Keywords: Argumentation, Attitudes and beliefs, Conversation/ Discourse analysis, Distributed cognition

Presenting Author: Christian Sebastián, Pontificia Universidad Católica de Chile, Chile; **Presenting Author:** Martín Vergara Wilson, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Macarena Sanhueza Céspedes, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Josefa Smart Torrealba, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Rosa LISSI, Pontificia Universidad Católica de Chile, Chile

In the last conference of the EARLI special interest group on social interaction in learning and instruction, the issue of the interpersonal co-laboration that logically precedes the internalization of a psychological activity in an individual, in terms of a psychological process that is socially distributed in interaction was discussed. Particularly, questions arose about how an epistemological belief looks like before being internalized and how we can grasp it. In this paper we will share an attempt of answering these questions. Applying tools of argumentation and dialogic analysis we will describe the epistemological shape that characterizes an exchange of arguments in an argumentation process. This epistemological shape, applied to tangible arguments, may also shed light on the understanding of epistemic cognition of psychophysiological individuals, helping to cleanse this traditionally messy concept.

Learner Preferences for Collaboration Scripts. Impact on Argumentation, Acceptance and Attitude

Keywords: Argumentation, Computer-supported collaborative learning, Conversation/ Discourse analysis, Educational technology

Presenting Author: Armin Weinberger, Saarland University, Germany; **Co-Author:** Thomas Puhl, Saarland University, Germany; **Co-Author:** Rola Sayegh, Saarland University, Germany

This paper examines the impact of learner preferences for different script guidance levels on acceptance of the respective script, collaboration attitude, and argumentation quality. Participants from Finnish and German universities (n = 93) took part in an asynchronous CSCL course. The course used Facebook as its learning platform, with three learning topics to be discussed and three variations of collaborative script guidance levels (*Explicit*, *Partially-Explicit* and *Minimal*), including assignment of roles and prompts. The results indicated a statistically significant negative effect on *Argumentation Quality* when scripts corresponded with learners' preferences, but no statistical effect on *Role Acceptance* or *Attitude* towards the collaboration script.

Pre-Post-Study on Argumentation and Political Judgement in Civic Education within Language Skills

Keywords: Argumentation, Citizenship education, Language (Foreign and second), Writing/Literacy

Presenting Author: Sabine Manzel, Universität Duisburg-Essen, Germany; **Co-Author:** Claudia Luft, Fak. für Gesellschaftswissenschaften / Institut für Politikwissenschaft / Didaktik der Sozialwissenschaften, Germany

The intervention study in civic education investigates the interrelation between subject-based skills like arguing and decision-making and writing skills. The basic assumption of the study is that through the production of domain specific types of texts, the epistemic function of language is developed and students' academic language ability strengthened as well as their subject related competences. The study wants to proof if there is any effect of a writing-support-model with scaffolding elements on students' civic literacy and language skills and which effects knowledge, SES and interest in the subject do have on the three linguistic actions "describing, explaining and reasoning". Using a statistically relevant sample from the 7th and 8th grades in comprehensive schools in North Rhine-Westphalia, students' subject-specific writing abilities will be tested and compared with their abilities in civic education. For a quantitative study with pre-post-design around 280 students will be surveyed in civic education for general language competences (C Test), socio-economic status (SES), motivation & interest (questionnaire), as well as for political knowledge (competence test) and subject-specific writing skills (rating of writing samples on political issues). A qualitative intervention is developed, implemented and evaluated across a number of lessons in spring. The research findings can be used on many levels in the realisation of an 'integrated language education', for example through the implementation of teaching and instructional frameworks for language learning through civic education or vice versa as well as through materials for all phases of teacher education and training.

Session D 13

13 August 2019 08:30 - 10:00

Seminar Room - S06

Single Paper

Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Instructional Design

Keywords: Collaborative Learning, Comprehension of text and graphics, Computer-assisted learning, Computer-supported collaborative learning, Cooperative/collaborative learning, Higher education, Instructional design, Meta-analysis, Multimedia learning, Physical Sciences, Problem-based learning, Science education, Secondary education, Teaching/instruction

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 18 - Educational Effectiveness

Chairperson: Venance Timothy, Ludwig-Maximilians-Universität (LMU), Tanzania, United Republic of

Designing a Multimedia Training to Understand Electric Circuits: Modality & Prior Knowledge Effects

Keywords: Comprehension of text and graphics, Instructional design, Multimedia learning, Physical Sciences

Presenting Author:Bernhard Ertl, Bundeswehr University Munich, Germany; **Co-Author:**Andras Csanadi, Bundeswehr University Munich, Germany; **Co-Author:**Bianca Watzka, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Christoph Hoyer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Raimund Girwidz, Ludwig-Maximilians-Universität (LMU), Germany

Fitting instructional guidance to individual needs of learners can be relevant for educational success. According to Cognitive Load Theory (CLT), both the modality of instruction and prior knowledge can affect the learners' information processing capabilities, and thus, learning. CLT proposes that instructional guidance should be presented in a multimodal manner (e.g., auditory-visual) rather than in a unimodal way (e.g., visual-visual). Yet, according to the expertise reversal effect, it is possible that from such presentation, perhaps only learners with low prior knowledge will benefit. The present study aimed to find out how we can implement the instructional design to promote learning on complex visual representations, such as electric circuits. To answer that question, we investigated to what extent (1) modality, (2) prior knowledge and (3) cognitive load may influence the performance on identifying electric circuits. 46 students from a German university participated in the study. They were assigned to either a unimodal (visual-visual, $N=23$) or to a multimodal (visual-auditory, $N=23$) condition. The results of a hierarchical regression showed that multimodal instruction and prior knowledge positively affected learning outcomes. But they did not completely account cognitive load. Therefore, according to the modality principle of CLT, when designing instructions for teaching complex visual representations, multimodal guidance is important. However, instructional guidance should be tuned better to personal needs and further factors should be considered for design to optimize learning.

Individual preparation for collaborative learning: systematic review and synthesis

Keywords: Collaborative Learning, Computer-supported collaborative learning, Cooperative/collaborative learning, Instructional design

Presenting Author:Stephan Mende, TU Dresden, Germany; **Co-Author:**Antje Proske, TU Dresden, Germany; **Co-Author:**Susanne Narciss, TU Dresden, Germany

Individual preparation for collaborative learning has been suggested to be a method effective in invoking collaborative learning activities conducive to deep comprehension. However, the related evidence is mixed. Accordingly, the present systematic review aims at contributing insights into the following questions: First, can individual preparation for collaboration foster effective collaborative learning activities? Second, are there instructional design-features which impact the effectiveness of individual preparations? The ICAP framework (Chi and Wiley, 2014) proposes that *interactive* activities during collaboration are best suited to induce deep comprehension. Thus, we searched the literature of collaborative learning, collaborative memory and group-brainstorming for studies capturing measures which indicate the sub-processes necessary for interactive activities to occur: 1) retrieving and pooling subject-matter related information, 2) referring to information pooled by other co-learners and 3) drawing inferences based on these information. We included studies either a) comparing conditions of collaboration with versus without preceding individual preparation or b) comparing different types of individual preparation for collaboration. Our findings revealed individual preparation for collaboration to not always foster the sub-processes of interactive activities during subsequent collaboration. Positive effects occur more likely if a generative task is applied, group awareness support is provided and care is taken concerning the right degree of supportive guidance. Given the limited evidence available for each comparison and sub-process, limitations and their implications for further research will be discussed.

The influence of the perceived instructional quality on the acceptance and use of an online course

Keywords: Computer-assisted learning, Higher education, Instructional design, Problem-based learning

Presenting Author:Charlotte Larmuseau, KU Leuven, Belgium; **Co-Author:**Piet Desmet, KU Leuven KULAK, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Given the growing use of online learning environments in higher education, it is important to further unravel how students' acceptance and use is influenced by their perceptions towards the instructional quality of these learning environments. This study includes the perceived quality of the instructional design based on the First Principles of Instruction of Merrill and students' acceptance based on the constructs perceived usefulness and perceived ease of use of the technology acceptance model (TAM). The aim of this study is twofold: a first aim is to investigate the influence of the perceived instructional quality on students' acceptance and the second aim is to investigate the impact of students' acceptance and the perceived instructional quality on the quantity (i.e., course activity) and quality (i.e., performance on task) of use. In this study a Moodle-based online learning environment for learning French as a foreign language was studied. Participants were 161 university students. Structural equation modeling (SEM) indicates that the perceived instructional quality has a significant positive association with students' acceptance. Furthermore, students' perceived instructional quality is positively related with quality, but not quantity of use, whereas students' acceptance of the online learning environment has no impact on the use of the learning environment.

Identification of an Evidence Base – Effective Teaching in secondary STEM Education

Keywords: Meta-analysis, Science education, Secondary education, Teaching/instruction

Presenting Author:Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

The idea of research informing practice is receiving a great emphasis in educational science. A crucial first step in a process which may eventually lead to an evidence-based practice is the identification of an appropriate evidence base. The recent proliferation of empirical research particularly in fields like STEM education, suggests that with the expansion of research there comes a more solid and differentiated evidence base that bears relevance even for more specific fields of practice. With this study, we seek to test this assumption by identifying an evidence base for a specific field of practice: STEM teaching for secondary students. As researchers generally agree that aggregated research findings are superior to individual studies, our aim is to identify aggregated effect sizes from recent meta-analytic research (since 2004). An extensive database search yielded 37 meta-analyses reporting aggregated effect sizes for instructional interventions (e.g. digital applications, inquiry learning etc.) on student learning outcomes specific for STEM subjects and secondary student populations. These included 72 effect sizes specific to both STEM subjects and secondary students. The availability of a substantial number of specific aggregated effect sizes also allowed testing differences between these specific and more general findings (overall effect sizes). Results showed that in most cases overall effects did not differ from specific aggregated effects and may thus provide some orientation even for more specific questions. All in all, our results demonstrate that current research offers expanding evidence based on aggregated effect sizes covering various kinds of interventions suitable for secondary STEM classrooms.

Session D 14

13 August 2019 08:30 - 10:00

Seminar Room - S15

Single Paper

Cognitive Science, Motivational, Social and Affective Processes, Teaching and Teacher Education

Mathematics and Motivation

Keywords: Early childhood education, Educational Psychology, Emotion and affect, Experimental studies, Knowledge creation, Mathematics, Motivation, Motivation and emotion, Problem solving, Quantitative methods, Science education

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Nele Kampa, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Effects of enjoyment and anxiety on strategy use and performance in mathematics

Keywords: Emotion and affect, Mathematics, Problem solving, Quantitative methods

Presenting Author:Stanislaw Schukajlow, University of Münster, Germany; **Co-Author:**Judith Blomberg, University of Münster, Germany; **Co-Author:**Johanna Rellensmann, University of Münster, Germany

Constructing drawings was previously found to be an important strategy for problem solving (Hembree, 1992). In the present study, we investigated a mediation

model that linked enjoyment and anxiety with performance in mathematics through the use of drawings. To test our hypotheses, we asked students in lower secondary school ($N = 220$) to answer questionnaires about enjoyment and anxiety and to take tests that would capture their intra-mathematical performance and modelling performance. We found that enjoyment and anxiety about making drawings influenced students' spontaneous use of drawings while they solved modelling problems. Moreover, the extent to which students enjoyed making drawings affected their modelling performance indirectly via the use of drawings during problem solving. Effects of anxiety on the use of drawings were moderated by students' intra-mathematical performance. Although anxiety about making drawings was found to predict modelling performance, we did not find indirect effects of anxiety on modelling via the use of drawings. Our findings demonstrate the importance of how students feel about certain strategies for the use of such strategies and performance in mathematics as proposed in the control-value theory of achievement emotions (Pekrun, 2006). In future studies, emotions about strategies should be considered important factors in interventions that are aimed at improving students' strategy use.

Individual interest and learning in secondary school mathematics and science context

Keywords: Knowledge creation, Mathematics, Motivation, Science education

Presenting Author: Erkka Laine, University of Turku, Finland; **Co-Author:** Marjaana Veermans, University of Turku, Finland; **Co-Author:** Koen Veermans, University of Turku, Finland; **Co-Author:** Andreas Gegenfurtner, University of Passau, Germany

Students' interest in learning science and mathematics varies on different ages and the most notable change happens usually during the transition from elementary to secondary school. Interest has been found to have a facilitating and mediating effect on learning outcomes but empirical studies on direct effects are rarer. This study aimed to investigate how students' individual interest in mathematics and biology relate to their learning outcomes during a school year. Participants were 104 (53 girls, 51 boys) 7th grade students aged 12-14 from a secondary school in Southern Finland. Data was collected three times during the school year through questionnaires, consisting of one item individual interest measures on mathematics, and biology, as well as students' respective grade level evaluations provided by the school. To investigate the predictive effects between the constructs a partial least squares model was constructed for both mathematics and biology. The results of the analyses showed that students' individual interest at the beginning of the school year at time 1 predicted their grades four months later at time 2 in both subjects. However this effect was not found any more five months later from time 2 to time 3. Students' grades at time 2 were found to predict their interest at the end of the school year at time 3. The results seem to indicate that the relationship between interest development and knowledge acquisition may not be as straightforward as expected but may in fact vary substantially during the course of a school year.

Math anxiety changes in response to math task, difficulty, and learning

Keywords: Educational Psychology, Emotion and affect, Mathematics, Problem solving

Presenting Author: Kelly Trezise, University of Chicago, United States; **Co-Author:** Robert Reeve, University of Melbourne, United Kingdom; **Co-Author:** Lindsey Richland, University of California Irvine, United States

Mathematics anxiety is a significant issue for math educations: impairing problem solving and increasing avoidance. However, few studies have examined the MA students experience in classrooms. Over two studies, we explored whether MA varies with math task, difficulty, and learning. In Study 1, we examined Australian adolescents' MA experienced during two tasks: solving algebraic math problems and making equivalence judgments. Students' MA was higher for the judgment task than the problem-solving task, and for both tasks, MA was higher for more difficult problems. In Study 2, we examined US 11-year-olds' MA before, during, and after a proportional reasoning lesson. Overall, MA increased during the lesson, but after the lesson, MA decreased to below MA levels prior to the lesson. Together the two studies demonstrate students' anxiety can fluctuate in response to educational content. The findings suggest that research is required to understanding the learning and performance implications of these fluctuations in anxiety.

"Good" or "well calculated"? Effects of feedback on performance and self-concept of preschoolers

Keywords: Early childhood education, Experimental studies, Mathematics, Motivation and emotion

Presenting Author: Valerie Berner, Catholic University of Eichstaett-Ingolstadt, Germany; **Co-Author:** Frank Niklas, University of Augsburg, Germany; **Co-Author:** Robin Segerer, University of Basel, Switzerland; **Co-Author:** Eva Oesterlen, Catholic University of Eichstaett-Ingolstadt, Germany; **Co-Author:** Katja Seitz-Stein, Catholic University of Eichstaett-Ingolstadt, Germany

Academic self-concept is a person's evaluation of their own behavior and capability in academic situations, and it not only reflects beliefs about a person's ability, but also relates to actual performance in academic tasks. Similarly, feedback which is defined as information about a person's learning process is associated with academic performance and with self-concept. In this study, we investigated whether mathematical competence and self-concept can be influenced by feedback during an interactive session with a child in which a linear number board game was played. German 5- to 7-year-old children ($N = 79$) played an adaption of the board game House of Numbers (HdZ) six times, either in a specific-feedback (e.g. "well calculated") or an unspecific-feedback (e.g. "good") group, or they belonged to a passive control group. In a pre- and posttest design, children's mathematical performance and mathematical self-concept (academic and affective) were assessed twice. The results show that playing the game and receiving feedback led to significantly greater gains in mathematical competence. Children in the specific feedback group showed the steepest slope. Moreover, all children displayed high mathematical self-concept at pretest which remained stable for the specific and no-feedback group but descended for the unspecific-feedback-group. Possible explanations and practical implications are discussed.

Session D 15

13 August 2019 08:30 - 10:00

Seminar Room - S12

Single Paper

Cognitive Science, Teaching and Teacher Education

Development of Early Numerical Competencies

Keywords: Action research, Case studies, Cognitive development, Cognitive skills, Early childhood education, In-service teacher education, Mathematics, Numeracy, Teacher professional development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Janina Lehmann, Ulm University, Germany

The role of spontaneous focusing on Arabic number symbols in early mathematical development

Keywords: Cognitive development, Early childhood education, Mathematics, Numeracy

Presenting Author: Bert De Smedt, KU Leuven, Belgium; **Co-Author:** Sanne Rathé, KU Leuven, Belgium; **Co-Author:** Joke Torbeyns, KU Leuven, Belgium; **Co-Author:** Lieven Verschaffel, KU Leuven, Belgium

Children's tendency to spontaneously focus their attention on Arabic number symbols (SFONS) has been identified as an important factor of their early mathematical development. The aim of the present study was to provide further evidence on the validity of the SFONS construct and to investigate whether it is associated with children's spontaneous focusing on numerosity (SFON), early numerical abilities, and mathematics achievement. We also tested whether these associations remained after age, parental education, spatial ability, language ability, and SFON were controlled for. One hundred and fifty-nine kindergartners (aged 4-5-years) participated in the study. Children completed measures of SFONS, SFON, numerical abilities (i.e., numeral/number word mapping, number word/numerosity mapping, numeral/numerosity mapping, and verbal counting), mathematics achievement, spatial ability, and language ability. Parental education was measured via a parent questionnaire. We investigated the validity of SFONS by means of confirmatory factor analysis comparing different models (i.e., a two-factor versus a one-factor model). The two-factor model with a separate SFONS and SFON factor provided the best fit to the data, indicating that SFONS is a construct separate from SFON. Correlation and regression analyses showed that SFONS was significantly associated with numerical abilities and mathematics achievement. These associations - except for verbal counting - remained significant when age, parental education, spatial ability, language ability, and SFON were controlled for. Together, these findings indicate that SFONS is a unique and relevant component of children's early mathematical development.

Cognitive Markers of Exceptionally High and Low Mathematical Performance in Preschoolers

Keywords: Cognitive skills, Early childhood education, Mathematics, Numeracy

Presenting Author:Merel Bakker, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium;

Co-Author:Bert De Smedt, KU Leuven, Belgium

Several studies have examined the contribution of cognitive factors to the acquisition of mathematical abilities. This study aimed to characterize preschoolers who have difficulty with early mathematical abilities and preschoolers who excel in early mathematical abilities in terms of such cognitive markers. Three mathematical ability groups (low, average, high) were created based on their persistent total score on a mathematical test battery. Our main goal was to characterize these groups in terms of (a) their domain-specific mathematical abilities and (b) the following domain-general predictors: language ability, spatial ability, and verbal and non-verbal working memory. Children were tested at the end of Kindergarten Year 2 (age 4 or 5; Spring 2017) and the beginning and end of Kindergarten Year 3 (age 5 or 6: Autumn 2017, Spring 2018). They completed eight mathematical tasks (i.e., verbal counting, nonverbal calculation, object counting, numeral recognition, number order, symbolic comparison, nonsymbolic comparison, dot enumeration) at time point 1 and 3, whereas at time point 2 they completed the domain-general measures. There were significant group differences for all tasks. In general, the low-achieving group performed significantly worse compared to average achievers, who in turn performed significantly lower than the high achievers. We performed logistic regression analyses to determine which cognitive factors contributed the most amount of unique variance to group membership. Language ability and non-verbal working memory were the strongest predictors of group membership. To conclude, our data indicate that the same cognitive factors are important predictors for whether children show low or high mathematical ability.

Participatory action research as a way to innovate mathematics and science teaching

Keywords: Action research, Case studies, In-service teacher education, Teacher professional development

Presenting Author:Shirley Miedijensky, University of Haifa, Israel; **Co-Author:**Irit Sasson, University of Haifa, Israel

This study examines in-service teachers who engaged in a professional development (PD) year-long course focused on conducting participatory action research (PAR) related to mathematics and science instruction. We focused on how the teachers perceived the process of the PAR, its impact on their practice and on their students' achievements. In addition, we characterized the various interactions between the teachers and the researcher. A multiple-case study approach was used and the data included interviews with teachers; observations; assessment tools; feedback questionnaire; researcher's blog; teachers' reflective journals; and students' assignments and tests. Four meta-design principles were implemented and embedded in the course and included: learning from and with peers; making thinking visible; making contents accessible; and promoting autonomy so teachers can become lifelong learners. The findings indicate that most of the teachers acknowledged the opportunity to conduct PAR and to work with peers, they have changed their teaching strategies and stated that they will continue to perform PAR in the future. Overall, it seems that implemented practice of PAR helped to both improve the teacher's teaching practice and the researcher's course design.

Finger numeral representations contribute to acquiring number semantics in 4-year-old children

Keywords: Cognitive development, Cognitive skills, Early childhood education, Numeracy

Presenting Author:Josetxu Orrantia, University of Salamanca, Spain; **Co-Author:**Rosario Sanchez, University of Salamanca, Spain; **Co-Author:**David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:**Laura Matilla, University of Salamanca, Spain

Recently, there has been heightened interest in studying early precursors of numerical competence. In this context, the role of finger numeral representations in children's developing quantitative skills has received increasing attention. Since fingers can be an external aid to represent numbers, it has been suggested that they could play a functional role in the development of basic numerical abilities. Indeed, it has been argued that finger representations may provide the "missing link" that allows the connection between children's (likely) innate capacity for processing numerosities and number symbols. In this study, we aimed at exploring whether performance on finger numeral representations explained individual differences in symbolic numerical magnitude processing (as measured on a number comparison task) controlling for other domain-general and domain-specific factors that impact children's ability to process number symbols. Results showed that finger representation processing skills were a unique predictor of symbolic numerical magnitude processing. This finding suggests that educational practices that encourage using finger representations may help to link numerical quantities and their symbolic representation. In other words, finger numeral representations would offer children the opportunity to learn the basic principles of numbers.

Session D 16

13 August 2019 08:30 - 10:00

Seminar Room - S11

Single Paper

Posthuman Openings: Participatory Methodologies and Ethical Strategies in Nordic Education Research

Keywords: Collaborative Learning, Early childhood education, Environmental education, Ethnography, Philosophy, Primary education

Interest group: SIG 25 - Educational Theory

Chairperson: Jessica Summers, University of Arizona, United States

Preschoolers ability and opportunity to participate in environmental inquiries and society

Keywords: Early childhood education, Environmental education, Ethnography, Philosophy

Presenting Author:Teresa Elkin Postila, Stockholm University, Sweden

The aim of the paper is to investigate preschoolers' ability and opportunity to participate in environmental inquiries and society. The paper elaborates on how a locally situated nine-month research project in Early Childhood Education stretched out to other parts of society, more specifically to a company in charge of water and waste. The children in this collaborative participatory research, informed by *relational ontology* and *relational child ethics*, problematized and had questions about environmental issues concerning water. To investigate these questions, the children were introduced to experts on water issues, and the experts were introduced to the children. By bringing children and experts together, unpredictable knowledge exchange were produced that opened up for the preschoolers to execute their rights to express themselves in accordance to their age and maturity in matters that concerned them (article 12 and 13 of the Convention on the Rights of the Child (CRC)). The paper experiments with a *diffraction analysis* in which different empirical and theoretical elements are read 'through one another'. By for example working with data from the meetings of experts and preschool children and reading this through the CRC, new ways of understanding preschoolers' ability and opportunity to participate become visible. The analysis shows that children's ability and opportunity to execute their rights to participate in environmental inquiries and society broadens, if and when research pays attention to what emerges in the meetings of theory, methodology, empirical data, and CRC.

Turning up and down the volume: Ethics and participation in research involving young children

Keywords: Collaborative Learning, Early childhood education, Ethnography, Philosophy

Presenting Author:Linnea Bodén, Stockholm University, Sweden

The aim of the paper is to explore the enactment of ethics and participation in research involving young children in a preschool setting. Through the metaphor of *volume* and the concept of *transposition*, the paper will explore the ongoing and shifting roles of the participating children in a large multi-methodological research project, while simultaneously addressing how the role of the author as one of the participating researchers in this project shifted with/in each different methodological practice. The paper focus on three research practices the children and the author were part of: video observations, child interviews, and explorative play-activities. Previous literature addressing ethics emphasize how the research methodologies affect the roles of both the children and the researcher. By working with the metaphor of volume and the concept of transposition as analytical tools, the analysis of the empirical material show how the roles continuously morphed and transformed as the participants moved between observations, interviews and play-activities. However, the paper also show how

the roles morphed *within* each different methodological practice. The metaphor of volume and the concept of transposition enables a problematizing of the notion of a causal relation between the methodologies put to work and the roles of both the children and the researcher. Instead, the results highlights how each specific and situated research practice produces multiple and morphing roles, both for the children and the researcher, which opens up to new and important questions concerning both ethics and participation.

Animalizing education – Multispecies storytelling in examining child-animal relations and care

Keywords: Environmental education, Ethnography, Philosophy, Primary education

Presenting Author:Riikka Hohti, Manchester Metropolitan University/University of Oulu, Finland

What kinds of animal relations matter to children, and how these relations form and evolve? This presentation deals with these questions based on ongoing multispecies ethnographic research into child-animal relations in school context. The background for the study is the era of the Anthropocene, or the New Climatic Regime, which highlights relationality and dependence between human and other than human beings. It also presents new kinds of questions and demands on educational sciences, which have until recently been shaped by anthropocentrism and human exceptionalism. The study adopts the theoretical frame of *more-than-human*, informed by posthumanist and new materialist theories and the feminist ethics of care. Fieldwork was conducted in a school located in a Finnish, largely immigrant background urban suburb, in which a huge greenhouse has been built as the home of hundreds of animals belonging to more than twenty species. This presentation focuses on a narrative approach inspired by Donna Haraway, multispecies storytelling, as a methodology to examine child-animal relations and care. Drawing from empirical examples, the presentation illustrates how this approach creates a materialdiscursive space that is neither to be understood as 'raw' data nor merely analysis, but a space in which to engage with theory and the material, affective and ethical/political details of child-animal caring situations. Rhizomatic storytelling is an open-ended way to work with the conflicts and troubles of multispecies co-existence with children, but it also allows for more hopeful modes of speculating and fabulating: for working towards education being resituated in the more-than-human world.

Session D 17

13 August 2019 08:30 - 10:00

Seminar Room - S13

Single Paper

Developmental Aspects of Instruction

Individual Learning in Group-based Preschool Settings

Keywords: Collaborative Learning, Early childhood education, Ethnography, Game-based learning, Interdisciplinary, Literacy, Mixed-method research, Self-regulation, Teaching/instruction, Video analysis

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Minna Törmänen, Switzerland

Conditions for individual scaffolding and learning in group-based investigative practices

Keywords: Collaborative Learning, Early childhood education, Interdisciplinary, Video analysis

Presenting Author:Hillevi Lenz Taguchi, Stockholm University, Sweden; **Co-Author:**Anna Palmer, Stockholm University, Sweden; **Co-Author:**Sofia Frankenberg, Stockholm University, Sweden; **Co-Author:**Tove Gerholm, Stockholm University, Sweden; **Co-Author:**Petter Kallioinen, Stockholm University, Sweden; **Co-Author:**Susanne Kjällander, Stockholm University, Sweden; **Co-Author:**Signe Tonér, Stockholm University, Sweden

For the last 20 years, educational researchers in Sweden have pushed for a group-based collaborative learning approach, in contrast to school practices employed in elementary school that focuses on scaffolding and instructing the individual child's learning. Collaborative practices evolve from children's interests, intrinsic motivation and sense of wonder in their encounter with the world. The aim is to discuss the conditions for individual scaffolding and learning in an intensified version of group-learning as the main intervention in a RCT study. The study involves 432 children in 29 preschool units, of which 9 units and 150 children were randomized to the group-based *Social-Emotional and Material Learning* (SEMLA) intervention. The methodology constitutes the elaborate program theory and theory of change (ToC) for this intervention and an analysis of intervention fidelity with video analysis. The SEMLA ToC is based on seven pedagogical components, drawing from multiple theories of development and learning, operationalized in a set of didactic strategies. This ToC specifies individual scaffolding, and close documentation of each individual child's learning activities, as part of the group-based practice. To research the variability in conditions for teacher fidelity of implementation, the analysis presents and discusses an evaluation of the defined criteria of fidelity. The results reveal that teachers experienced difficulty in achieving individual scaffolding and fidelity to SEMLA. This is discussed in relation to how group learning has historically been taken up and practiced. The results can contribute to the development of the conditions for individual scaffolding of individual children's learning.

Digital Individual Learning for Body & Mind in group based preschool contexts

Keywords: Early childhood education, Game-based learning, Mixed-method research, Self-regulation

Presenting Author:Sofia Frankenberg, Stockholm University, Sweden; **Presenting Author:**Susanne Kjällander, Stockholm University, Sweden; **Co-Author:**Hillevi Lenz Taguchi, Stockholm University, Sweden; **Co-Author:**Anna Palmer, Stockholm University, Sweden; **Co-Author:**Tove Gerholm, Stockholm University, Sweden; **Co-Author:**Petter Kallioinen, Stockholm University, Sweden; **Co-Author:**Signe Tonér, Stockholm University, Sweden

Digital teaching resources, such as learning games played on tablets, provide the potential for individualized learning in preschool group settings. Taking as a point of departure current knowledge of how children learn when designing digital learning environments has the potential to target individual children's proximal zones of development in group-based pedagogical contexts and may thereby enhance individual children's learning and development. The aim of this paper is to describe how instructional design focusing on self-regulation and early math, can be incorporated in group based pedagogy through the use of playful body exercises and digital teaching resources. Methodology: The pedagogical approach Digital Individual Learning for Body & Mind (DIL) was developed and researched as part of the intervention study Enhancing Preschool Children's Attention, Language and Communication Skills: a Randomized Controlled Trial involving 432 children in 29 preschools in Sweden. A pilot study raised concerns that educators might resist the DIL intervention due to a preference for the tradition of group-based explorative learning as opposed to instructional learning. In order to monitor the implementation of the intervention, participant observations with video were used. Fidelity was assessed via the analysis of student variables in the form of log data from the digital game and of educator self-reported activities. The findings show that the intervention was successfully implemented and that the focus on supporting individual children was possible in this group-based preschool context. The discussion focuses on opportunities for introducing individualized training in the context of Swedish group based learning.

Group-based vs. individual teaching & one vs. multiple epistemologies in preschool literacy practice

Keywords: Early childhood education, Ethnography, Literacy, Teaching/instruction

Presenting Author:Lena Aronsson, Stockholm University, Sweden

The objective of this paper is to discuss the dual tasks of Swedish early childhood education to support the learning processes of *each individual child*, and the learning processes of *the group of children* in one primary focus of the Swedish preschool curriculum: literacy teaching and practices for children 1-5 years-of-age. To exemplify what guides this issue, I will focus on literacy practices from a nine-month ethnography and focus-group study. The methodology of the study consisted of a cartographic mapping of the various epistemologies underpinning the practices. Often, discussion falls into debates on whether to understand that practices should be guided, either by epistemologies targeting the individual child, or by epistemologies targeting a collective of children. However, results from this study show that literacy methodologies rely on a multiplicity of theories and epistemologies, clearly favoring socio-cultural ideas and teaching practices,

while previously common Piagetian constructivist teaching practices are understood as temporal exceptions and problematic deviations. I will argue for a necessity to problematize the commonly assumed idea of theoretical consensus prevailing in the discussion, and argue that it is not just possible, but that educators to some degree already tend to employ practices that draw from multiple epistemologies. This enables both teaching vis-a-vis the idea of the groups' social construction of literacy learning, and simultaneously enables targeting teaching and scaffolding of individual children's literacy development and learning. A future that requires complex and flexible skills could benefit from multi-epistemologically based early childhood education, targeting both individuals and groups.

Session D 18

13 August 2019 08:30 - 10:00

Seminar Room - S03

Single Paper

Cognitive Science, Learning and Special Education

Tomorrow's Mathematics Education: The Role of Instruction Style and Task Difficulty

Keywords: Cognitive skills, Early childhood education, Learning disabilities, Mathematics, Numeracy, Quasi-experimental research, Reasoning, Science education, Special education

Interest group: SIG 15 - Special Educational Needs, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Martin J. Tomasik, University of Zurich, Switzerland

Working Memory and Numeracy Intervention for Children with Poor Mathematical Performance

Keywords: Cognitive skills, Numeracy, Quasi-experimental research, Special education

Presenting Author: Kerry Lee, The Education University of Hong Kong, Hong Kong; **Co-Author:** Rebecca Bull, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:** David Munez, National Institute of Education / Nanyang Technological University, Singapore; **Co-Author:** Kiat Hui Khng, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:** Fiona Cheam, Ministry of Education, Singapore; **Co-Author:** Ridzuan Abd Rahim, Ministry of Education, Singapore

Although many working memory training studies have found near but not far transfer effects (Melby-Lervåg & Hulme, 2013), much of the literature is based on a handful of training protocols. We tested a computerised WM training protocol with games based on the running span, keep track, complex span, and n-back paradigms. To cater to children with different difficulties profiles, we also designed a protocol with integrated WM and numeracy content and a separate condition with only numeracy training. Participating children ($N = 428$, $M_{age} = 83.85$ months) were assigned to one of 16 conditions based on a 4 (difficulties groupings: mathematics, mathematics and English, mathematics and WM, versus mathematics, English, and WM) \times 4 (treatments: numeric WM, non-numeric WM, numeracy, versus active control) \times 4 (timepoints: pre-test, mid-intervention, immediate post-test, 6-month post-intervention) mixed-plot design. Findings from pre-test to post-test showed that there were significant differences in mathematical fluency improvement across the four difficulties groups. Collapsed across treatment conditions, children with only mathematical difficulties and average working memory showed greater rates of improvements than did the other groups. However, the interventions failed to improve mathematical performance on measures of early numeracy and mathematical skills beyond what was observed in the active control group.

Persistence of the Building Blocks' impact on Ecuadorian children' early numerical abilities

Keywords: Early childhood education, Mathematics, Numeracy, Quasi-experimental research

Presenting Author: Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:** Gina Bojorque, KU Leuven, Belgium; **Co-Author:** Joke Torbeyns, KU Leuven, Belgium; **Co-Author:** Jo Van Hoof, KU Leuven, Belgium

This longitudinal intervention study investigated the impact of the Building Blocks (BB) program on Ecuadorian children's early numerical abilities over a two-year period (kindergarten, first grade). Participants were 313 children with varied SES backgrounds and coming from 18 classrooms. During the kindergarten year, children were randomly assigned to either an experimental or a control condition. Children in the experimental condition received the BB program during the school year, whereas the children in the control condition received the regular mathematics program. In first grade, the children in both groups received the regular national mathematics program for grade one. Children's early numerical abilities were assessed in three time points, i.e., at kindergarten entry, at the end of kindergarten, and at the end of first grade, by means of the Tools for Early Assessment in Math (TEAM). In all our analyses, we controlled for children's initial working memory, intelligence, SES and age. Multilevel analyses indicated that, by the end of kindergarten, children in the experimental condition outperformed their peers in the control condition in early numerical abilities. Furthermore, by the end of grade one, children who received the intervention in kindergarten exhibited significantly higher early numerical abilities than those who did not. The BB program thus had a positive impact on Ecuadorian children's early numerical abilities, not only immediately after the completion of the program but also one year later. We discuss the theoretical and educational implications for early numeracy development in general, and for the Ecuadorian situation in particular.

Effects of Mathematics Interventions for Students with Intellectual Disabilities

Keywords: Learning disabilities, Mathematics, Numeracy, Special education

Presenting Author: Susanne Schnepel, University of Zurich, Switzerland; **Co-Author:** Pirjo Aunio, University of Helsinki, Finland

Research on mathematics instruction for students with intellectual disabilities (ID) is scarce, and little is known about effective teaching practices. To our knowledge, only two meta-analyses – published more than 10 years ago – and no systematic review have been carried out. In this study, we report the results of a systematic review investigating the characteristics of mathematics interventions for students with ID aged between 5 and 12 years. Fifteen studies with 195 students in total were included in this review. Nine studies were carried out with a single-subject design and four studies with a control group design. Two studies used a pre-posttest design without a control group. Single-case studies reported high effect sizes. Results show that the majority of the studies implemented systematic instruction in one-to-one or small group settings. No studies carried out interventions in (inclusive) classroom. This raises questions on mathematics instruction of students with ID, which will be discussed in the Symposium.

Thinking with data: Which factors predict successful interpretations of covariation data?

Keywords: Cognitive skills, Mathematics, Reasoning, Science education

Presenting Author: Christopher Osterhaus, Ludwig-Maximilians-Universität, Germany; **Co-Author:** Erika Stauss, University of Wisconsin-Madison, United States; **Co-Author:** Martha W. Alibali, University of Wisconsin-Madison, United States

Data-interpretation skills are important in modern knowledge societies. This aspect of scientific thinking, however, is challenging: Children and adults struggle with the interpretation of covariation evidence, such as data that is presented in contingency tables. The present study investigates factors that contribute to reasoners' successful interpretation of covariation data. A total of 233 participants (50 sixth and seventh graders, 183 undergraduates) interpreted 13 contingency tables, and, in addition, we assessed their mathematics skills, their metaconceptual understanding of the nature of science (i.e., what is science about?), and their experimentation skills (i.e., what makes a good experiment?). General information-processing skills (inhibition, working memory, and language skills) were measured as control variables. On average, middle-schoolers interpreted 9 of the 13 contingency tables correctly ($SD = 3$), and the adults 10 ($SD = 3$). A latent class analysis confirmed earlier findings and revealed three distinct strategies: *compare two* (middle-schoolers: 24%, adults: 13%); *anchor and compare* (middle-schoolers: 46%, adults: 39%); and *compare conditional probabilities* (middle-schoolers: 30%, adults: 48%). There was a significant partial correlation (independent of the influences of the cognitive control variables) between the number of correct contingency interpretations and participants' experimentation skills. For the subsample of middle-schoolers, there were significant relations between correct strategy use (compare conditional probabilities) and mathematics and experimentation skills. Our results confirm earlier findings on diverse strategy use in the interpretation of contingency tables, and they suggest that children's ability to interpret such data depends on their mathematics and experimentation skills. Implications for the design of interventions are

discussed.

Session D 19

13 August 2019 08:30 - 10:00

Seminar Room - S02

Single Paper

Learning and Instructional Technology

Learning Technologies

Keywords: Artificial intelligence, Computer-supported collaborative learning, Game-based learning, Instructional design, Learning Technologies, Metacognition, Motivation, Pre-service teacher education, Science education, Self-regulation

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 17 - Methods in Learning Research

Chairperson: Panagiotis Kosmas, Cyprus University of Technology, Cyprus

Promoting Collective Cognitive Responsibility through Idea-Friend Maps in Large Class

Keywords: Computer-supported collaborative learning, Instructional design, Learning Technologies, Science education

Presenting Author:Xueqi Feng, The University of Hong Kong, China; **Co-Author:**Jan van Aalst, University of Hong Kong, Hong Kong; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong

The research field of learning analytics has grown quickly in the last decade. However, practical techniques are still not widely used in education settings. This study designed and examined a knowledge-building environment that combines the use of learning analytics tool for creating the "Idea-Friend Map" with Knowledge Forum for Primary Five students. Students in the experimental class used the Idea-Friend Map tool (n=53), whereas those in the control class (n=54) conducted the same knowledge building activities without the use of analytics tool. The data sources included a pre-/post science test and discourse from the Knowledge Forum databases. Results showed that students in the intervention class showed better conceptual understanding and collective cognitive responsibility. These findings inspire future work on the processes and dynamics of how students use learning analytics for knowledge building.

Leveraging Theoretical and Methodological Innovations for Supporting Identity Exploration and Change

Keywords: Learning Technologies, Metacognition, Motivation, Self-regulation

Presenting Author:Amanda Barany, Drexel University, United States; **Co-Author:**Aroutis Foster, Drexel University, United States; **Co-Author:**Mamta Shah, Drexel University, United States; **Co-Author:**Hamideh Talafian, Drexel University, United States; **Co-Author:**Mark Petrovich, Drexel University, United States

A predominant challenge in education is to design opportunities to prepare learners for futures that require agentic exploration and self-transformation (Bransford & Schwartz, 1999). This is important because successful normative school experiences may provide the fundamental building blocks for students' identification with science, technology, engineering and mathematics (STEM) disciplines. However, such experiences may fail to promote the flexibility and adaptability skills needed to remain competitive in a rapidly-evolving 21st century workforce (U.S. Department of Education, 2017). This paper will illustrate the connections between identity exploration and possible selves and demonstrate the status of research in augmented virtual learning environments (AVLEs) as ecosystems to facilitate identity exploration. This will be supported by an introduction to the Projective Reflection (PR) theoretical and analytical framework, which conceptualizes learning as a process of identity exploration over time. The paper will demonstrate the application of PR and the use of Quantitative Ethnography (QE) as theoretical and methodological innovations to address the challenges of supporting and assessing identity exploration in a STEM AVLE with high school students. Projective Reflection offers one way for learners to practice skills that promote adaptability and flexibility in the face of a changing world. Our application of PR with AVLEs utilizes user data to examine player change over time (i.e. knowledge, interest and valuing, self-organization and self-control, and self-perceptions and self-definitions as defined by PR). QE facilitates the leveraging of learning analytics approaches by assessing the complexity of identity exploration and change in AVLEs.

Topic Modeling of Pre-Service Teachers' Computational Thinking Reflections

Keywords: Artificial intelligence, Game-based learning, Learning Technologies, Pre-service teacher education

Presenting Author:Maria Cutumisu, University of Alberta, Canada; **Co-Author:**Qi Guo, University of Alberta, Canada

Computational thinking is an essential competency of the 21st century, defined as the thinking processes involved in formulating solutions to problems in a way that can be carried out by an information processing agent. More and more countries around the world have been adopting a computational thinking curriculum for K-12. However, the training of teachers who can teach their students computational thinking is often lacking. Most universities and colleges do not include computational thinking courses or content in their core courses. Moreover, it is difficult to know what pre-service teachers think about CT and their role in promoting it. Traditional qualitative techniques based on human raters are impractical in analyzing essays for hundreds of students. This research employs topic modeling, a machine learning modeling technique, to automatically examine the discourse of pre-service teachers with regards to computational thinking that emerged from their written reflections. In one section of an undergraduate Introduction to Educational Technology core course offered at a large university in North America, n = 144 pre-service teachers wrote a short reflection about their experience taking a 20-hour Accelerated Intro to Computer Science course offered by Code.org in a visual programming online learning environment. Results show that pre-service teachers reflected on computational thinking concepts and practices and they connected the coding activity to their prior knowledge and experiences.

Session D 20

13 August 2019 08:30 - 10:00

Seminar Room - S05

Single Paper

Instructional Design, Learning and Special Education, Teaching and Teacher Education

Secondary Education

Keywords: Case studies, Cultural diversity in school, History, Mixed-method research, Primary education, Qualitative methods, Science education, Secondary education, Special education, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Enrico Postiglione, Italy

Characteristics and effectiveness of a summer school for secondary education

Keywords: Case studies, Qualitative methods, Secondary education, Teaching/instruction

Presenting Author:Sandy Verbruggen, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Bieke De Fraine, KU LEUVEN, Belgium

This study aimed at analysing the characteristics, the effectiveness and the factors that influence the organisation of a summer school for secondary education. Internationally, research on (the negative effects of) summer learning loss, which is defined as a loss of knowledge and skills during summer holidays (Paechter et al., 2015), is growing. These studies also indicate that low SES-students tend to experience a larger summer learning loss than their high SES-classmates, both in primary and in secondary education (Lynch, & Kim, 2017; Paechter et al., 2015). Consequently, also the number of summer learning programs for students, both in primary and in secondary education, increases. Following a qualitative research design, we studied the (perceived) effectiveness, the strengths, the weaknesses and the factors that influence the organisation of a Flemish summer school for secondary education students. More specifically, the

constructivist variant of the Grounded Theory approach (Charmaz, 2014) was adopted. Participants were 17 students, 6 teachers, 4 members of the school federation and 12 parents. For the data-collection, individual interviews, a focus group interview and questionnaires were used. The results showed that students, teachers and parents reported positive effects of this summer school on both the school performance and the school career of the students. Also, students, teachers and parents reported both strengths (e.g. individual support) and weaknesses (e.g. short duration) of the summer school. Lastly, the study showed that there are many factors that influence the organisation of a summer school (e.g. school size, availability of teachers,...).

How Instructional Experiences Shape Climate Perceptions in Science Classrooms: An Exploratory Study

Keywords: Case studies, Science education, Secondary education, Teaching/instruction

Presenting Author: Jose Felipe Martinez, University of California, United States; **Co-Author:** Jonathan Schweig, RAND Corporation, United States

Student surveys are increasingly used to understand and monitor classroom climate. Climate indicators derived from student surveys have been shown to be reliable and correlated with student outcomes and with other indicators of instruction. Recent work suggests that within-classroom variation (or disagreement) in climate perceptions is substantively interpretable. However, these studies are primarily quantitative, and are limited in their ability to inform hypotheses about the *nature* of student disagreement—e.g., a significant correlation with student achievement may suggest disagreement is not merely measurement error, but it does not say if it reflects instructional differentiation, explicit or implicit differences in expectations, or some combination of these and other factors. Utilizing a multiple case study approach based on data from the Measures of Effective Teaching (MET) project, we analyzed lesson videos in nine case study classrooms. We found that classrooms varied in the ways in which teachers create different instructional experiences for students. Evidence from the videos suggests students in low consensus classrooms have fewer opportunities to make meaning together. Implications of results for teacher formative and summative evaluation are discussed.

Steps towards a more inclusive education system: A case study in Flanders

Keywords: Case studies, Primary education, Secondary education, Special education

Presenting Author: Aster Van Mieghem, University of Antwerp, Belgium; **Co-Author:** Karine Verschueren, KU Leuven, Belgium; **Co-Author:** Katja Petry, KU LEUVEN, Belgium; **Co-Author:** Elke Struyf, University of Antwerp, Belgium

International policy developments have put inclusive education (IE) on the reform agenda. Recent legislation in Flanders aims to reduce the current segregated school system in favor of IE (M-decreet, 2014). Nevertheless, practitioners showed a lot of resistance against the implementation of this new legislation. An integrated care policy, which also supports teachers, can reduce this resistance. In this policy, internal and external counsellors engage the entire school team in assuring that students with special educational needs (SEN) get the support they need at school (Aluede, Imonikhe, & Afen-Apaida, 2007). This study is therefore interested in what ways schools have an integrated care policy that supports teachers. In order to answer this research question a case study research was set up in 20 schools, 10 primary and 10 secondary schools. Semi-structured interviews were held with school leaders (n=26), and focus groups with teachers (n=78), counselors (n=71), and students (n=105). The results show that the schools have already made great efforts to collaborate within the school team and with external actors, as well as on the professionalization of the school team. However, it is noticed that a shared care vision, which requires targeted support from the school leader, as well as the design of supportive structures and procedures within the school, and collaboration with parents and students are often lacking. Based on our results we conclude that all eight pillars are necessary for creating a well-integrated care policy in order to support teachers in handling daily individual needs of students with SEN.

Epistemology and social identity in history teachers' experiences with teaching sensitive issues

Keywords: Cultural diversity in school, History, Mixed-method research, Secondary education

Presenting Author: Geerte M. Savenije, University of Amsterdam, Netherlands; **Co-Author:** Bjorn Wansink, Utrecht University, Netherlands; **Co-Author:** Albert Logtenberg, Amsterdam University of Applied Sciences, Netherlands

Over the last decades much has been written about teachers' difficulties with the teaching of sensitive historical topics. Particularly the teaching of multiple perspectives on such topics would be challenging. This study examined teachers' perceptions of the sensitivity of topics and their teaching experiences in relation to their epistemological beliefs and social identification in history education. Data sources are an online questionnaire with open questions among Dutch history teachers (n=81) and individual interviews (n=3). The most mentioned sensitive themes were 'conflict between Islamic and non-Islamic people', 'colonialism' and 'WWII and Holocaust'. Factors of sensitivity were, according to the teachers, the students' social or religious identities, the large diversity in and fierceness of students' opinions, students' emotional engagement or hurt feelings, teachers' wish to discuss multiple perspectives not well received by the students, and students' indifference to a topic. Differences in epistemological beliefs between the teachers and the students prevented teachers to engage some students to study and evaluate multiple perspectives - the thing they all reported as the most difficult regarding teaching sensitive issues. Whereas the teachers sought epistemological authority in academic disciplinary criteria, some students referred to the Quran or particular media channels as the only valuable source of knowledge. The teachers did not openly reflect upon the difference in epistemological beliefs with their students or legitimatise explicitly their own beliefs about epistemological authority. Insights from this study can inform pedagogies of history teachers to stimulate awareness that sensitivities can be grounded in frictions between epistemic cultures.

Session E 1

13 August 2019 10:15 - 11:45
Lecture Hall - H06 - Amazon Hörsaal
Invited Session

Meet the EARLI Journal Editors

Keywords: Action research, Case studies, Comparative studies, Content analysis, Qualitative methods, Quantitative methods, Student learning, Teaching/instruction

Interest group:

Chairperson: Äli Leijen, University of Tartu, Estonia

Discussant: Äli Leijen, University of Tartu, Estonia

EARLI publishes three peer-referred journals which are all available for free readership to all members; Learning and Instruction, Educational Research Review and the newest open access journal Frontline Learning Research. Additionally, the EARLI book series, New Perspectives on Learning and Instruction is designed to communicate the high quality research on learning and instruction to a broader audience of researchers and post-graduate students in education and psychology. EARLI members are fully encouraged to submit their current research on the association's journals. The EARLI journal editors will introduce the EARLI journals and the EARLI book series. They will inform audience about specific services and goals of each journal and how to select the right journal for publishing their work. Additionally, some basic guidelines for potential authors will be presented. The Meet the EARLI Journals' Editors symposium aims to inform the EARLI members for the journals that the association publishes and they are in the members' service. Additionally, the editors will inform the audience for the specific aims of each journal, how to select the right journal to publish their research and they will present guidelines for authors.

Learning and Instruction

Presenting Author: Lars-Erik Malmberg, University of Oxford, United Kingdom

As an international, multi-disciplinary, peer-refereed journal, Learning and Instruction provides a platform for the publication of the most advanced scientific research in the areas of learning, development, instruction and teaching. The journal welcomes original empirical investigations. The papers may represent a variety of theoretical perspectives and different methodological approaches. They may refer to any age level, from infants to adults and to a diversity of learning and instructional settings, from laboratory experiments to field studies. The major criteria in the review and the selection process concern the significance of the contribution to the area of learning and instruction. This is an audience-initiated session and participants are invited to raise any question or issue they feel pertinent.

Educational Research Review

Presenting Author:Hans Gruber, University of Regensburg, Germany

Educational Research Review is an international journal addressed to researchers and various agencies interested in the review of studies and theoretical papers in education at any level. The journal accepts high quality articles that are solving educational research problems by using a review approach. This may include thematic or methodological reviews, or meta-analyses. The journal does not limit its scope to any age range. The journal invites articles on the broad range of settings in which people learn and are educated (school settings, corporate training, formal or informal settings, etc.). Empirical studies or theoretical contributions that do not include a critical review analysis are not accepted.

Frontline Learning Research

Presenting Author:Thomas Martens, Medical School Hamburg, Germany

The third EARLI journal provides open access publishing and welcomes innovative and risk taking research in the field of learning and instruction. Frontline Learning Research (FLR) is an electronic-only journal that invites articles that represent future trends in research on learning and educational sciences. FLR is also a forum for multidisciplinary research on learning and learning environments and aims to initiate new theoretical and methodological approaches in the learning sciences. FLR is now indexed in SCOPUS. Open access publishing is free of charge for EARLI members and requires only a small fee for non-members. At the EARLI conference we will more deeply explain the guiding principles of FLR and will provide some examples and ideas what features might be considered innovative and risk-taking. We will also discuss new forms of scientific communication like audio and data files that could enrich classical formats.

EARLI Book Series New Perspectives on Learning and Instruction

Presenting Author:Mien Segers, Maastricht University, Netherlands

New Perspectives on Learning and Instruction is the international, multidisciplinary book series of the European Association for Research in Learning and Instruction (EARLI) and is published by Routledge. The aim of the series is to present to the scholarly community high quality, theoretically-driven research on a specific theme in the domain of learning and instruction. Books that are published in the series are innovative, attempting to forge new conceptions of the field. Originality, scientific merit, and significance for the field are what guide the series. Both edited collections and sole-authored texts that meet these criteria are considered for publication. In addition, in 2017, the EARLI Book Series will start with the publication of state-of-the-art edited books. They provide an essential introduction to the state-of-the-art in a specific field in the domain of Learning and Instruction. These fields are represented by the Special Interest Groups of EARLI and Emergent Field Groups. The main structure of each state-of-the-art book is as follows. First, each book begins with an outline of the field's relevant historical, conceptual and theoretical backgrounds. Second, each book presents an up-to-date series of high-quality original empirical articles representing the main research topics in the specific field. Third and finally, it presents new directions for research. The focus of the Book Series is on European work, however, contributions from non-European researchers and non-members of the European Association for Research in Learning and Instruction are invited. The series is designed to appeal to a wide audience of researchers and post-graduate students in education and psychology. Latest Book: Mäkitalo, Å, Nicewonger, T.E. & Elam, M. (Eds.). (Forthcoming). *Designs for Digital Experimentation and Inquiry: Approaching learning and knowing in digital transformation* London: Routledge. (2019). Messman, G, Segers, M., Dochy, F. (Eds.), *Informal Learning at Work: Triggers, Antecedents, and Consequences*, London: Routledge (2018).

Session E 2

13 August 2019 10:15 - 11:45

Lecture Hall - H10

Invited Session

Learning and Social Interaction

Interactive learning environments that support cognitive, emotional and identity development

Keywords: Attitudes and beliefs, Conversation/ Discourse analysis, Educational Psychology, Emotion and affect, Learning disabilities, Peer interaction, Pre-service teacher education, Social aspects of learning and teaching, Social development, Social interaction, Special education

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Sandra Racionero-Plaza, Spain

Discussant: Antonia Larrain, Universidad Alberto Hurtado, Chile

This symposium presents multidisciplinary work on the role that interactive learning environments have to improve education of children and youth. Organised by AMIE - Multidisciplinary Educational Research Association, this symposium includes three papers that, from the fields of psychology and education, analyse interactive learning environments organised in different contexts and stages of education, including primary, secondary and higher education, and the different improvements obtained. The first paper focuses on the special school context to examine the implementation of an interactive learning environment –interactive groups– and their impact on cognitive and social development of students with disabilities. The second paper analyses the role that peer interactions among adolescents have in their socialization in gender violence and how educational action based on creating dialogic spaces of interaction can transform peer interactions that promote attraction to violence into peer interactions that promote attraction to equality in affective-sexual relationships, thus promoting a healthier and satisfactory socio-emotional development. The third paper examines how the dialogic literary gatherings foster the emergence of language of desire supporting attraction toward relationships free of violence. The fourth paper focuses on the dialogic gatherings, an interactive learning environment applied to the university context with student teachers, in order to analyse how interaction and dialogue around some of the highest educational theorists enhance pre-service teachers' identity formation.

Interactive Learning Environments in Special Schools

Presenting Author:Silvia Molina, Universitat Rovira i Virgili, Spain

High-quality learning environments based on what works in education benefit all students and can be particularly beneficial for children with disabilities. This paper contributes to advance knowledge to enhance the quality of education of students with disabilities that are educated in special schools. This research analyses in which ways, if any, interactive learning environments can be developed in special schools and create better learning opportunities for children with disabilities. A case study was conducted with students with disabilities (N = 36) and teaching staff in a special school, involving interviews and focus groups. We argue that rethinking the learning context by introducing instruction models based on interaction benefit children with disabilities and provide high-quality learning and safe and supportive relationships for these students, thereby promoting their educational and social inclusion.

The role of peer interactions in the prevention of gender violence among adolescents

Presenting Author:Sandra Racionero-Plaza, Universidad Loyola Andalucía, Spain; **Co-Author:**Ana Vidu, University of Deusto, Spain; **Co-Author:**Lidia Puigvert, University of Barcelona, Spain

The number of adolescents who experience violent sexual-affective relationships in sporadic and stable relationships is growing internationally. Framed by theories of preventive socialization of gender violence, the MEMO4LOVE project seeks to provide scientific evidence on the role of social interaction on emotional learning related to sexual-affective development, to ultimately inform preventive actions that can be implemented in secondary schools. This paper presents data on one of the studies of the project which examined the role played by the peer group in shaping cognitive and affective schemata related to attraction and sexual-affective relationships, either fostering attraction to males with violent attitudes and behaviors or attraction to males with egalitarian attitudes and behaviors. A mixed method approach was employed using the communicative methodology of research. The sample (N = 38 for the qualitative study, N = 141 for the quantitative study) was composed of 14- and 15-year-old adolescents. The analysis of data revealed that interactions in the peer group significantly shape the thought and feelings regarding sexual-affective relationships in adolescence: while certain interactions clearly foster attraction to dominant males who have violent attitudes with women, other communicative interactions with peers, i.e. friendship, protect the youth from violent sexual-

affective relationships. The paper reports the specific mechanisms through which this happens. Evidence-based psycho-educational programs addressed to prevent gender violence in adolescence can benefit from these results by intervening at the level of the peer group and focusing on raising awareness about and questioning the *coercive discourse* that surrounds adolescents' sexual development

Dialogic Gatherings in teacher education: affordances for pre-service teachers' identity formation

Presenting Author:Nerea Gutierrez Fernandez, University of Deusto, Spain; **Presenting Author:**Rocio Garcia-Carrion, University of Deusto, Spain; **Co-Author:**Andrea Khalfaoui, University of Deusto, Spain; **Co-Author:**Beatriz Villarejo, University of Deusto, Spain

Decades of empirical research have shown the value of dialogic teaching and learning for school classrooms, from early years to high-school, and across disciplines, from science to literacy. However, less research has explored its implementation and impact in the university context. This paper examines a discussion-based pedagogic strategy named "Dialogic Gatherings" in a Spanish university. Dialogic gatherings are currently implemented in more than 1000 schools in thirteen countries in Europe and Latin America, with children and adults reading and discussing the greatest literary works. In this study we have examined the implementation of this strategy in initial teacher training with a particular purpose to examine its affordances for enhancing pre-service teachers identity formation. An intervention study was conducted with 55 Master students distributed in four groups to analyse how interaction and dialogue around some of the highest educational theorists might enhance pre-service teachers' identity formation. Six sessions lasting 60 minutes each were observed, audio-recorded and transcribed for an inductive analysis. Conventional content analysis approach was conducted to identify emerging codes, contrasted and refined by the researchers. Our results revealed interactions among pre-service teachers create opportunities for students to critically reflect on teacher skills and values, their role as teachers and their social self as a teacher. This exploratory study shows the potential for student teachers to foster critical thinking with identity-related topics. Further research is needed to determine the role of the text or the dialogic space in this process.

The language of desire towards non-violent relationships in Dialogic Literary Gatherings

Presenting Author:Nerea Gutierrez Fernandez, University of Deusto, Spain; **Co-Author:**Garazi Lopez de Aguilera, University of Barcelona, Spain

Dialogic Literary Gatherings (DLG) have generated a wide array of scientific knowledge that evidences the transformative power of this educational action in the life of participants, regardless of their age, gender or socioeconomic status. However, the extent to which this scenario, in which participants make meaning through classical literatura, fosters the emergence of the language of desire - the capacity of language to raise attraction and be desired- towards non-violent relationships, has not yet been explored in depth. Taking literature on DLG and on the language of desire into account, we argue the potential of DLG regarding using language of when talking about models linked with good values, uniting both ethics with aesthetic dimension. Therefore, the aim of this paper is to bring new insights to the transformative potential of DLG in relation to this underexamined issue. Twenty-eight sessions from two different schools have been observed and analyzed, which have been complemented with three focus groups with some of the participants. Main findings outline that dialogic features in DLG are associated to the use of language expressing attractiveness towards non-violent relationships and partners. Further research is needed in order to analyze to what extent this change in this language might promote a transformation of behavior and personal relationships.

Session E 3

13 August 2019 10:15 - 11:45

Lecture Hall - H09

Invited Session

Learning and Social Interaction

Measuring students' social participation: Innovating the field with behavioral data

Keywords: Assessment methods and tools, Social aspects of learning and teaching, Social interaction, Special education, Student learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 15 - Special Educational Needs

Chairperson: Nadine Spörer, University of Potsdam, Germany

Discussant: Alexander Minnaert, University of Groningen, Netherlands

In this invited symposium, we will discuss the aim and current activities of the EARLI-Centre for Innovative Research (E-CIR) "Measuring and supporting students' social participation: Innovating the field with behavioral data". Whereas the academic achievements of students in inclusive learning settings are promising, the social participation of students with special educational needs has become a more challenging issue. Current research on social participation is based on self-report measures providing highly aggregated data which neglect real social contacts among students. Therefore, more basal behavioral data of social interactions is necessary to gain a deeper understanding of the mechanisms underlying social participation. The E-CIR aims to close this research gap with innovative technologies. The goal is to answer the following main research questions: (1) Under which circumstances will different behavior-based measures of students' social participation lead to reliable and valid empirical data? (2) To what extent can these measurement instruments assess both the social structure and social participation processes within inclusive settings? (3) To what extent can behavior-based technologies measure the effects of classroom-based interventions aimed at fostering social participation of students? Presenting the conception of the E-CIR at the EARLI conference offers the possibility to discuss ideas within the scientific community at an early stage of the project. During the symposium, current activities of the E-CIR members with a special focus on measuring social participation (e.g., wearable RFID devices, smartphone-based experience sampling method) will be presented after which the presenters would like to go into discussion with the audience.

Using RFID technology to measure social interactions: A journey towards a real time social network

Presenting Author:Thorsten Henke, Leibniz University Hannover, Germany; **Co-Author:**Timon Elmer, ETH Zürich, Switzerland; **Co-Author:**Christoph Stadtfeld, ETH Zurich, Switzerland

Many of the well known theories in the social sciences are grounded in the idea that frequent and personal social interactions have a huge impact on social systems like groups and societies and are also the basis for these. However, despite the fact that they are at the core of many theories research in this area is usually scarce as interactions are inherently hard to measure. This presentation will give an overview on how so called RFID (Radio Frequency Identification) badges can be used to overcome this obstacle for the further development of social science research. Especially the validity and reliability of this new tool will be discussed in in-depth and also practical information on the instruments further improvement will be provided. Furthermore we will also give an overview on how this instrument can be applied to different contexts and age groups (primary school, college) and more and less structured settings (college classroom, primary school field trip).

Two examples of RFID research and the potential for applying RFID devices in educational settings

Presenting Author:Julia Eberle, Ruhr-Universität Bochum, Germany; **Co-Author:**Christoph Stadtfeld, ETH Zurich, Switzerland; **Co-Author:**Timon Elmer, ETH Zürich, Switzerland; **Co-Author:**Thorsten Henke, Leibniz University Hannover, Germany

RFID devices can be seen as reliable measurement instruments for capturing social interactions. Two examples show how they have been meaningfully used to investigate relevant educational research questions. In the first study about the integration of PhD students into a scientific community during a scientific event, RFID measures gave insights into the selection of interaction partners and scientific collaboration partners. In the second study, RFID measurement showed the difference in first-semester students' social interaction patterns in relation to their depressive symptoms. These examples show that RFID devices provide great opportunities for research on inclusive education as they are a highly objective data collection method, can be used economically and without interfering with students' lives, and is very sensitive to measuring change. These advantages can be of very useful for providing new insights into the social interactions of students with and without special educational needs and stimulate the design of effective social interventions to support social inclusion.

Beyond mere counting: How experience sampling can help to understand social interactions

Presenting Author:Carmen Zurbriggen, University of Bielefeld, Germany; **Co-Author:**Christian Huber, University of Wuppertal, Germany

The aim of this paper is to propose a profound theoretical framework as well as an innovative survey method for the investigation of the quality of social

interaction as one important aspect of social participation. To date, social participation at school has usually been measured by classic sociometric methods. The data obtained generally represent the result of a social integration process. In the E-CIR, we focus on earlier stages in this process and try to capture the early development of social acceptance. A crucial theoretical approach is the intergroup contact theory. Previous research on intergroup contact theory indicates that social contacts can change attitudes towards a person in both directions, positively and negatively. Decisive for the direction is the quality of contacts. In addition to information on social contacts measured by the RFID technology, we therefore aim to also collect data on contact quality. One indicator for the quality of social contacts are emotions experienced while interacting with a person or in a group. The emotional experience can be assessed with the experience sampling method (ESM). The purpose of this method is to capture people's experience in their real-life context. For this, data is collected *in situ*, on one or more occasions daily and over a period of several days or weeks. Finally, several possibilities and limitations of the ESM and its use to assess the quality of social interaction are discussed.

Applicability of ESM in school: Quality of students' social interaction

Presenting Author:Margarita Knickenberg, University of Bielefeld, Germany; **Presenting Author:**Chantal Hinni, University of Fribourg, Switzerland; **Co-Author:**Carmen Zurbruggen, University of Bielefeld, Germany

Due to the intensive and repeated measurement over various situations and times, the experience sampling method (ESM) is an appropriate approach to assess the quality of social interaction. Three consecutive investigations focusing on the examination of social interaction in connection with emotional experiences in early adolescence are presented exemplarily in this contribution with reference to ESM. The studies provide information of positive effects on students' emotional experience in grade 6 while collaborating with their peers. They also give evidence about changes from grade 6 to grade 9 in social interaction quality in the students' everyday school life compared to their leisure time. Methodological challenges and limitations of assessing social interaction quality in early adolescence by means of ESM will be discussed.

Session E 4

13 August 2019 10:15 - 11:45

Lecture Hall - H08

Invited Session

Learning and Instructional Technology

Achievements in Measuring and Supporting Student's Self-Regulated Learning in Learning Technologies

Keywords: Artificial intelligence, Collaborative Learning, Emotion and affect, Learning analytics, Learning Technologies, Metacognition, Self-regulation, Technology

Interest group: SIG 16 - Metacognition

Chairperson: Sanna Järvelä, University of Oulu, Finland

Organiser: Inge Molenaar, Radboud University Nijmegen, Netherlands

Discussant: Roger Azevedo, University of Central Florida, United States

In this panel discussion, we will discuss the results obtained by the EARLI-Centre for Innovative Research (E-CIR) "Measuring and Supporting Student's Self-Regulated Learning in Adaptive Educational Technologies". The aim was to develop our understanding of multimodal data that unobtrusively capture cognitive, meta-cognitive, affective and motivational states of learners over time. Triangulation of multichannel data provides a fundamentally new approach to capture critical phases of SRL and SSRL. The goal of this panel is to discuss the results obtained by the five labs that are part of the ECIR. Each of the partners will outline their progress over the last 4 years discussing five points: i) SLR processes they focused on in their research, ii) Data stream(s) used to measure these processes, iii) The innovative methods used to measure SRL iv) New forms of support developed based on these measurements v) Results and insights obtained and how these advance our understanding of SRL During the panel ECIR members will be present the answers to these questions after which the panel will go into discussion with the audience about this work and the future research agenda regarding measuring and supporting SRL with multimodal data.

Progress in research on regulation in collaborative learning – triangulation of multimodal data

Presenting Author:Sanna Järvelä, University of Oulu, Finland

In our research we have been working for understanding and supporting regulation in collaborative learning. We have conducted exploratory and intervention research in ecologically valid settings following the temporal collaboration progress of high school and elementary school students working in physics and science. Our data collection covers input from various multimodal sources (i.e., 360° video, log data, heart rate (HR), electrodermal activity (EDA), self-report) aiming to make invisible mental cognitive, motivational, and emotional learning processes visible to both learners and teachers to allow them to regulate those processes. We will review our progress in data analysis and findings as well share limitations and challenges in analysis. In all, our findings reflect the complexity of the relationships between regulated learning constructs and demonstrates the potential value of EDA and physiological measures in self-, co- and socially shared regulated learning research.

Progress in Research on Data Analytics Techniques for Self-Regulated Learning

Presenting Author:Dragan Gasevic, Monash University, Australia

Our research centered on computational techniques that can model the dynamic nature of self-regulated learning. The data sources we have primarily used include clickstreams, unstructured text of online discussions, and self-reported surveys collected in large enrollment higher education classes or MOOCs. We suggested and validated computational methodologies that combine unsupervised machine learning with data analytics techniques that can encapsulate sequential dimensions of events about self-regulated learning. The findings of our experiments indicate significant with moderate to large effect sizes in terms of improvements in the use of tactics and strategies, learning outcomes, and satisfaction. We will review the main findings to date and discuss limitations that warrant future research.

Process Mining Techniques to analyse Temporal Data of Self-Regulated Learning

Presenting Author:Maria Bannert, Technical University of Munich (TUM), Germany

Based on research of self-regulated learning (SRL) we see individual regulation as a set and specific sequence of regulatory activities which have to be performed (Azevedo, 2009; Winne & Hadwin, 2008). Research shows that successful students perform different regulatory activities such as analyzing, planning, monitoring and evaluating cognitive, motivational, emotional and communicative aspects during their learning. So far, most research has concentrated on frequency analysis of such regulatory activities. However, we assume that the analysis of temporal data on student's learning processes would give deeper insights into how and when they could be effectively scaffolded during their learning effectively. Hence, the aim of our research is to analyse the temporal order of both spontaneous as well as prompted individual regulation during computer-based learning tasks using process mining techniques.

Visualization of learning processes to reveal students' self and socially shared regulation

Presenting Author:Inge Molenaar, Radboud University Nijmegen, Netherlands

Our research focusses on the interaction between cognitive and metacognitive activities to understand how the cyclical process between control and monitoring orchestrates students cognitive activities. We used new methods, statistical discourse analysis and process mining to understand sequential and temporal elements of S(S)RL in single data streams. We examined multiple data streams to understand how logfiles enrich think-aloud and discourse data. Finally, we explored how different machine learning techniques can be used to elicit advanced understanding from logfile data. These explorations led to new insights in sequential and temporal characteristics of S(S)RL as well as the development of personalized visualizations that function as an inference for students to understand how they control and monitor their learning. Our future goal is to translate new insights into an adaptive system in which system regulation is

adjusted to a students needs for regulation support. This hybrid human-system regulation allows for personalized support and may function as a mechanism to teach S(S)RL skills.

Session E 5

13 August 2019 10:15 - 11:45

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Invited Session

Cognitive Science

Teaching for conceptual change-In search for learning environments to tackle the natural number bias

Keywords: Achievement, Comprehension of text and graphics, Conceptual change, Game-based learning, Instructional design, Mathematics, Misconceptions, Teaching/instruction

Interest group: SIG 03 - Conceptual Change

Chairperson: Jo Van Hoof, KU LEUVEN, Belgium

Organiser: Wim Van Dooren, KU LEUVEN, Belgium

Organiser: Jo Van Hoof, KU LEUVEN, Belgium

Discussant: Andreas Obersteiner, University of Education Freiburg , Germany

A good understanding of rational numbers is of crucial importance for the learning of more advanced mathematical concepts. However, ample research indicates that learners of different ages struggle with various aspects of the rational number concept, particularly those aspects of rational numbers that differ from natural numbers, and tend to apply natural number properties. In the research literature, this phenomenon has been termed "natural number bias". Research has also shown that overcoming this bias requires several radical conceptual changes in students, wherein students have to revise fundamental aspects of their prior knowledge. This process has been shown to be very slow, and rarely successful. In this invited symposium, we bring together four studies that focus on instruction on aspects of rational number, specifically aimed at achieving the aforementioned conceptual change. We start with a study that diagnoses the current situation, by means of an international textbook analysis. This study clearly indicates that in current textbooks, the explicit mentioning of differences between natural and rational numbers is very rare. The other three contributions report on more systematic attempts to address specific aspects of the natural number bias. The second contribution describes how "traditional" teaching can address aspects of the natural number bias for preservice teachers, and how this development can be diagnosed. A third contribution describes an intervention by means of refutational text to tackle misconceptions about the effect of operations. Fourth, a study was conducted to investigate the effects of playing a computer game on understanding various aspects of rational number.

Tackling the natural number bias – A comparative textbook analysis

Presenting Author:Wim Van Dooren, KU Leuven, Belgium; **Co-Author:**Konstantinos Christou, University of Western Macedonia, Greece; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Matthew Inglis, Loughborough University, United Kingdom; **Co-Author:**Saku Määttä, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Andreas Obersteiner, University of Education Freiburg, Germany; **Co-Author:**Patricia Heck Ribeiros, University of Education Freiburg, Germany; **Co-Author:**Jo Van Hoof, KU Leuven, Belgium; **Co-Author:**Maria Triandafyllou, University of Ioannina, Greece; **Co-Author:**Xenia Vamvakoussi, University of Ioannina, Greece; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Gerald Wittmann, University of Education Freiburg, Germany; **Co-Author:**Beth Woollacott, Loughborough University, United Kingdom

A good understanding of rational numbers is important. Still, many learners struggle with various aspects of rational numbers, in particular where rational numbers differ from natural numbers, of which students have substantial prior knowledge. In these cases, they tend to apply natural number properties, a phenomenon termed "natural number bias". Accordingly, students may benefit from instruction that draws on their prior knowledge about natural numbers, but at the same time highlights differences between rational and natural numbers. In this study, we analysed 3rd to 6th grade mathematics textbooks and teachers manuals from five different countries. We searched for explicit references to differences between natural and rational numbers regarding symbolic representation, number size, operations, and order (discrete vs dense). Overall, we observed very few explicit references to such differences in all countries, and in each country some domains completely lacked references. In conclusion, the textbook series as such do not seem to offer many opportunities for students to develop a deep understanding of particularly with respect to how rational numbers differ from natural numbers.

Increasing Primary Teachers' Fraction Understanding by Decreasing the Natural Number Bias

Presenting Author:Tobias Hell, University of Innsbruck, Austria; **Co-Author:**Florian Stampfer, University of Innsbruck, Austria

Mastering rational numbers is crucial for the success of students in secondary school. To this aim, the opportunity for a conceptual change during the transition to lower secondary school can be key. In Austria, a first and very distinctive confrontation with rational numbers already occurs at the end of primary school. In the last few years, several studies investigated the trajectories of rational numbers and identified the natural number bias (NNB) as a robust obstacle for a sustainable understanding of rational numbers. The NNB is characterized as the tendency to (inappropriately) apply natural number properties in tasks with rational numbers (Ni & Zhou, 2005). We investigated the NNB of pre-service primary teachers in Western Austria. For the first part of our study, we developed a web app and implemented the same selection of items of the Rational Number Sense Test. The web app enabled us to record precise response times in addition to item accuracies of 318 pre-service teachers. Based on these data, three clusters were identified using clustering of mixed-type data. The clusters' profiles can be clearly linked to a conspicuous affection of the NNB. Our findings show that a large portion of pre-service teachers still have severe misconceptions about rational numbers. As a second part, we collected data from another 98 pre-service teachers after two lessons focusing on the NNB phenomenon and its consequences. Learners were classified based the data from the larger survey. As a result, learners with a persisting NNB could easily be identified.

Using refutational text to remedy the Multiplication Makes Bigger misconception

Presenting Author:Konstantinos Christou, University of Western Macedonia, Greece; **Co-Author:**Argyro Prokopou, National and Kapodistrian University of Athens, Greece

Students across ages and nationalities struggle with understanding rational numbers. In this intervention study a refutational text was administered to 6th grade students to help them remedy their misconception that multiplication always makes the operand numbers bigger. This misconception stems from a *natural number bias*, i.e., the tendency to use the initial knowledge of natural numbers to interpret data on rational numbers. Students' initial experience with operation between natural numbers affect them to think that multiplication makes the initial numbers bigger while division makes them smaller, independently of the numbers involved. Refutation texts directly report to students their wrong beliefs and immediately overturn them by presenting the alternative correct ideas in a comprehensive and persuasive way using certain arguments and examples. Series of studies in science and mathematics education supports the effectiveness of refutational texts in teaching compared to traditional texts. The hypothesis of the current study was that a refutational text which only referred to the misconception *multiplication makes bigger* could help students overcome the misconceptions about the size of results of multiplication and division. From the 87 6th grade students that participated in the Pre/Post/Late-Post-test intervention study, only 51 students (experimental group) received the refutational text. The results suggested that the refutational text may help the students remedy the multiplication makes bigger misconception, and the results had a long-term effect. In addition, students transferred the acquired knowledge about multiplication, also to division: the results showed statistically significant less mistakes of the kind *division makes smaller*, after the intervention.

Training adaptivity with rational numbers: The development of NanoRoboMath

Presenting Author:Tomi Kärki, University of Turku, Finland; **Co-Author:**Jake McMullen, University of Turku, Finland; **Co-Author:**Erno Lehtinen, University of Turku, Finland

Students have a great deal of difficulties learning about rational number concepts, as they are confounded by misapplying reasoning about natural numbers to fractions and decimals, referred to as a natural number bias. Some of the most difficult features of rational numbers include understanding that (1) there are infinitely many representations for any rational number, (2) there are infinitely many rational numbers between any two rational numbers, and (3) operators smaller than one make the multiplicand smaller and dividend bigger. These features are targeted in the NanoRoboMath serious game, developed as a tool to support the integration of different aspects of students' rational number conceptual knowledge. In this case study, we describe the mathematical activities that participants engage in while playing NanoRoboMath, and argue that such gameplay could support the integration of conceptual knowledge that is expected to be foundational to adaptivity with rational numbers. In addition, an ongoing experiment of the game's effectiveness will be reported upon in the final presentation.

Session E 6

13 August 2019 10:15 - 11:45

Lecture Hall - H11

Symposium

Assessment and Evaluation, Higher Education

Beyond Grade Point Average: Conceptualization and measurement of learning gains in higher education

Keywords: Assessment methods and tools, Attitudes and beliefs, Competencies, Educational attainment, Higher education, Interdisciplinary, Student learning

Interest group: SIG 04 - Higher Education

Chairperson: Jan Vermunt, Eindhoven University of Technology, Netherlands

Organiser: Edith Braun, Justus-Liebig-Universitaet Giessen, Germany

Organiser: Jan Vermunt, Eindhoven University of Technology, Netherlands

Discussant: Johannes Bauer, University of Erfurt, Germany

One of the main objectives of higher education (HE) is preparing students for the demands of the labour market. To enable an adequately definition, training and assessment of needed competences in the context of a dynamic, ever-changing occupational world, the conceptualization and operationalization of required demands into valid and scalable measurement instruments have gained recent prominence. Not only discipline-specific competences and expert knowledge need to be assessed during studies, but also more generic competences. The aim of this symposium is to bring together and discuss recent approaches to conceptualize and measure learning gains in and into higher education.

Four contributions will highlight different perspectives and attempts to do so. They have in common that they conceptualize learning gain much broader than the traditional Grade Point Average (GPA). Conceptualizations vary from cognitive, metacognitive and socio-communicative skills, motivation and interest, epistemic profiles, love for research, to morality. Measurement instruments include self-reports, tests, and role plays. Contexts within which the studies took place vary from unconstrained entry in Flanders, medium constrained entry in Germany to highly selective universities in Finland and the UK. All papers have in common that they use large samples and sophisticated statistical approaches to achieve their aims. They all share the passion to deepen our understanding of what students learn in and into higher education through other means than averaging the grades students achieve. Ample time will be reserved to engage in a highly interactive discussion with the audience about the implications for the coherence of European Higher Education.

Conceptualisation and Assessment of communication skills as learning gains in higher education

Presenting Author:Edith Braun, Justus-Liebig-Universitaet Giessen, Germany; **Co-Author:**Ulrike Schwabe, DZHW - German Centre for Research on Higher Education and Science Studies, Germany; **Co-Author:**Daniel Klein, University of Kassel, Germany

Socio-Communicative skills hold a major significance among learning gains of higher education (Vermunt et al., 2018). So far, self-ratings are often used to assess socio-communicative skills in order to analyse learning gains. In order to verify learning gains of higher education, it is necessary to assess skills longitudinal. Furthermore, we need assessment instruments, which allow to measure skills at a specific point of learning. The aim of this contribution is to present such a test of students' communication skills. We use Habermas' theory of communicative action as the theoretical starting point for the conceptualisation for the assessment of communication skills. Habermas differentiates between two types of social action namely strategic action and communicative action. The assumed theoretical conceptualisation is tested empirically in this contribution. Furthermore, we analyse the correlation between the new assessment and self-ratings of communication. Therefore, we developed 10 role-plays including observation forms accordingly to Habermas' differentiation of social action and strategic action. Four hundred eighty-eight (488) students from 10 higher education institutions participated at the role-plays. Empirically, the two theoretical dimensions can be empirically proved using confirmatory factor analysis ($\chi^2 = 103.5$; $df = 53$; $p < .001$; $CFI = 0.95$; $RMSEA = 0.04$). In contrast, no systematically correlation with self-ratings can be found ($r < 0.08$). Finally, the benefit as well as constraints of such a conceptualisation of an instrument will be discussed.

Assessing and providing feedback on cognitive and non-cognitive skills in the transition to HE

Presenting Author:Lien Demulder, KU Leuven, Belgium; **Co-Author:**Elisabeth Roels, Ghent University, Belgium; **Co-Author:**Jordi Heeren, KU LEUVEN, Belgium; **Co-Author:**Jonas Willems, University of Antwerp, Belgium; **Co-Author:**Wouter Duyck, Ghent University, Belgium; **Co-Author:**Lieve dewachter, KU Leuven, Belgium; **Co-Author:**Sofie Vispoel, Arteveldehogeschool, Belgium; **Co-Author:**Marlies Lacante, Faculty Psychology and Educational Sciences, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

Columbus is a large scale assessment and feedback instrument to improve the career-decision making process of students in their last two years of secondary education in Flanders, by providing feedback on students' academic readiness. It measures cognitive and non-cognitive capacities through self-reports and tests and gives potential first-year students feedback on their academic readiness towards higher education, focusing on self-beliefs, motivation, regulative and cognitive strategies, math, reasoning, vocabulary and language strategies skills and study interests. During school year 2016-2017, more than 16000 students filled in one, more or all components of Columbus. Based on different reliability and validity measures, we deleted or adjusted the items of some components and released a new version in academic year 2017-2018 in which more than 22000 students participated. Columbus hopes to stimulate a more profound decision-making process when choosing a study for higher education by mapping important cognitive and non-cognitive capacities for academic readiness in higher education.

Learning gain across disciplines in selective universities

Presenting Author:Sonia Ilie, University of Cambridge, United Kingdom; **Co-Author:**Ashton Brown, University of Cambridge, United Kingdom; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Learning gain is a contested concept, with a variety of definitions, operationalisations, and potential uses for both system-wide accountability, and course improvement, in higher education. In this paper we put forward a conceptual framework and associated measurement instrument to capture learning gain across academic disciplines. We report on the results of a three-round two-year longitudinal study implementing this measurement instrument with students in 11 selective English universities. We observe different initial levels of skills, abilities, and competencies, and variation in the patterns of change (and therefore gain) by academic discipline, and by study stage. We discuss what this may mean for the use of learning gain measures more widely and suggest that our measure may play an important role in evidence-based programme-level improvement that accounts for the expectations and goals of institutions, academic disciplines, and all stakeholders.

Measuring learning gains: University students' epistemic profiles and their conceptions of learning

Presenting Author:Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Elina E. Ketonen, University of Helsinki, Finland; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands

Some students prefer to reflect on their knowledge and knowing, while others prefer directly applicable or certain knowledge. Such combinations of beliefs constitute theories that may manifest themselves as epistemic profiles. It is possible to measure learning gains of higher education by looking at such profiles.

We examined university students' epistemic profiles and the relations of such profiles to conceptions of learning, age, discipline, and grades. We measured epistemic beliefs: reflective learning, collaboration, valuing metacognition, certain knowledge, and practical value (Lonka et al., 2008). The participants were 1515 students from five faculties who filled in questionnaires including epistemic beliefs (MED NORD, Lonka et al., 2008). The structural validity was analysed by using confirmatory factor analysis (CFA). By using latent profile analysis (LPA) we examined epistemic profiles. The three-class LPA solution fit the data: *fact-oriented* (25 %), *collaborative-reflective* (26 %), and *practical fact-oriented* (49 %) students. Of a subgroup (n=781), grades and conceptions were compared between profiles (ANOVA): intake-, construction-, and use of knowledge (ILS, Vermunt, 1998). Conceptions of learning varied according to the profiles: *collaborative-reflective* group (mostly teacher students) scored high in "construction of knowledge". They were more likely to be female and mature students, and their academic achievement was the best. *Fact-oriented* group (mostly engineering and science students) scored highest in "intake of knowledge". *Practical fact-oriented* scored highest in "use of knowledge" (other than law students). Epistemic theories as measured by MED NORD were thus closely with conceptions of learning measured by ILS.

Session E 7

13 August 2019 10:15 - 11:45

Lecture Hall - H07

Symposium

Teaching and Teacher Education

Teacher-student relationships for at-risk children

Keywords: At-risk students, Early childhood education, Educational Psychology, Motivation and emotion, Primary education, Quasi-experimental research, Social interaction

Interest group:

Chairperson: Tessa Weyns, KU LEUVEN, Belgium

Organiser: Debora Roorda, University of Amsterdam, Netherlands

Discussant: Karine Verschuere, KU LEUVEN, Belgium

Research has demonstrated the importance of affective teacher-student relationships for the development of children. Furthermore, some students appear to be more at risk for developing negative relationships with teachers than others, such as boys and students with behavioral problems. However, some student characteristics remain understudied. In the present symposium, we therefore focus on the impact of understudied student characteristics on teacher-student relationship quality, that is, autism spectrum disorder, giftedness, high work-family stress in parents, and ethnic minority status (longitudinal changes in relationship quality are not often studied for ethnic minorities). Our symposium includes data from four different countries (Portugal, Belgium, the Netherlands, United States) and studies with different, complementing designs (a cross-sectional study, two longitudinal studies, and an experimental study). The first, longitudinal, study covers the transition from preschool to primary school and examines the impact of maternal relational frustration on teacher-student conflict and the intervening role of child self-control in a sample of dual earners families. The second study has an experimental design and focusses on the influence of giftedness on teachers' enthusiasm and self-efficacy with regard to effectively interacting with children. The third, longitudinal, study examines how racial/ethnic minority status impacts year-to-year changes in teacher-child relationship quality (conflict and closeness) from kindergarten to third grade. The fourth and final study uses a cross-sectional design to examine the influence of autism spectrum disorder on upper elementary students' relationship perceptions (conflict, closeness, and negative expectations) and its associations with students' engagement.

Connecting home and school relationships: Child self-control as a linking mechanism?

Presenting Author: Tiago Ferreira, University of Porto, Portugal; **Co-Author:** Joana Cadima, University of Porto, Portugal; **Co-Author:** Marisa Matias, University of Porto, Portugal; **Co-Author:** Teresa Leal, University of Porto, Portugal; **Co-Author:** Paula Mena Matos, University of Porto, Portugal

This study examined the role of child behavioral self-control (SC) in mediating the interconnections between parental relational frustration and teacher-child conflict. Participants were 215 children (55% boys, *M* age at T1 = 4.00 years) their mothers and teachers. Children were all from dual-earner families and were followed longitudinally in 4 time-points, covering the preschool period and the transition to primary school. Maternal relational frustration was reported by mothers, while children's SC and teacher-child conflict were reported by teachers. Mothers also reported their work-family conflict (T1 - T3). Path analysis was used to test a cross-lagged model investigating the longitudinal links between maternal relational frustration, child SC and teacher-child conflict while considering the effect of work-family conflict on maternal frustration. Results suggest reciprocal effects between child SC and both maternal frustration, and teacher-child conflict. Although there was a consistently negative effect of teacher-child conflict on child SC over time, the effect of maternal frustration on child SC was only significant at the children's later ages. Teacher-child conflict was predicted by child SC. Mothers were more likely to experience relational frustration towards their children when they experience higher levels of work-family conflict and when children display lower levels of self-control. Maternal frustration was also indirectly affected by teacher-child conflict, via child SC. These findings stress the bidirectional effects of mother- and teacher-child relationships on children's SC, highlighting the role of child behavior in mediating the interconnections between relationships in different contexts. Moreover, this study clarifies the influences of work-family dynamics on parenting.

Teacher perceptions of gifted children and possible moderators: An experimental study

Presenting Author: Tessa Weyns, KU Leuven, Belgium; **Co-Author:** Franzis Preckel, University of Trier, Germany; **Co-Author:** Svenja Matheis, Koblenz-Landau University, Germany; **Co-Author:** Karine Verschuere, KU Leuven, Belgium

The first aim of this study is to examine teachers' self-efficacy and enthusiasm towards teaching cognitively gifted children as compared to average-ability children. We expected these to be lower for gifted children, in accordance with the disharmony hypothesis. Second, our study examines the potential moderating role of teacher characteristics (i.e., teachers' academic self-concept, contingencies on academic competence, and general self-esteem). We conducted an experimental study with 395 teachers-in-training (68% women; *M* age=21.70 years), in which respondents were presented with a vignette describing an ambiguous situation regarding a hypothetical child. Using a 2x2 between-subjects design, the child was described as gifted or average-ability and as a girl or a boy. Afterwards, the teachers filled out a questionnaire regarding their self-efficacy and enthusiasm with regard to effectively interacting with the child. They also filled out a questionnaire regarding their own academic self-concept, contingencies of academic competence, and general self-esteem. A set of ANOVA'S was carried out. Teachers reported lower self-efficacy for gifted students than for average-ability students ($F(1,393)=9,045, p=.003, \eta^2=0.017$). There was no significant difference in teachers' enthusiasm regarding gifted versus average-ability students. Linear regressions showed that teachers' academic self-concept positively predicted teachers' student specific self-efficacy ($t=3.679, p$

Racial/ethnic differences in teacher-child relationships in early elementary school

Presenting Author: Kathleen Rudasill, Virginia Commonwealth University, United States; **Co-Author:** Paul Dizona, University of Nebraska-Lincoln, United States; **Co-Author:** Colin McGinnis, University of Nebraska-Lincoln, United States; **Co-Author:** Kenji Madison, University of Nebraska-Lincoln, United States

The role of child race/ethnicity in teacher-child relationship quality, especially in early elementary grades when children's academic trajectories are established, has not been explored in depth. Here we examined teacher-child relationship quality in the US across K-3rd grade as a function of race/ethnicity and gender using data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010-2011 (ECLS-K: 2011). Results show several clear trends. First, for both genders, Black/African American children were rated as having the highest Conflict with teachers from K-3rd grade. Second, Asian boys and girls were rated lowest in Conflict. Third, boys and girls in all racial/ethnic groups showed a downward trend in closeness across grades, with White, non-Hispanic girls starting with and maintaining the highest closeness. Asian boys had the lowest Closeness. Results suggest that boys, particularly Black/African American boys are at highest risk for negative teacher-child relationships, which is similar to other research. In addition, Asian children, especially Asian boys, may also be at risk for going unnoticed in the classroom. Implications will be discussed.

Relationships between Teachers and Students With Autism Spectrum Disorder and Students' Engagement

Presenting Author: Debora Roorda, University of Amsterdam, Netherlands; **Co-Author:** Marjolein Zee, University of Amsterdam, Netherlands; **Co-Author:** Helma Koomen, Research Institute of Child Development and Education, Netherlands

It has frequently been found that at-risk students share more negative relationships with their teachers than other students. Having an autism spectrum disorder (ASD) is a risk factor that has remained relatively understudied in the field of affective teacher-student relationships. Therefore, the present study investigated whether students with ASD perceive their relationships with teachers differently than students without ASD. Furthermore, as teacher-student relationships tend to have more impact on the school functioning of at-risk students, we also examined whether associations between relationship quality and students' school engagement were stronger for students with ASD. Data were collected in the Netherlands. Our sample consisted of 119 students with ASD (113 boys) and 182 students without ASD (86 boys). Students reported about their relationship with their teacher and their engagement with school work. Multilevel analyses showed that students with ASD experienced more conflict and marginally more negative expectations in their relationships with teachers than students without ASD, whereas there were no differences in the degree of closeness. Closeness was positively related to emotional engagement, whereas conflict and negative expectations were negatively associated with emotional engagement for all students. For behavioral engagement, associations with conflict were stronger for students with ASD, whereas associations between closeness and behavioral engagement were stronger for students without this disorder. Results seem to indicate that students with ASD perceive the relationship with their teacher as more negative and that especially conflict in the relationship may be more harmful for these students.

Session E 8

13 August 2019 10:15 - 11:45

Lecture Hall - H05

Symposium

Motivational, Social and Affective Processes

Students' reading motivation: influencing factors and effects

Keywords: Experimental studies, Literacy, Meta-analysis, Mixed-method research, Motivation, Reading comprehension, Student learning, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Chantal Lepper, TU Dortmund, Germany

Organiser: Chantal Lepper, TU Dortmund, Germany

Organiser: Justine Stang, TU Dortmund University, Germany

Organiser: Nele McElvany, TU Dortmund University, Germany

Discussant: Maik Philipp, University of Teacher Education Zurich, Switzerland

Throughout all educational phases, students' reading motivation is a core topic with international significance. Previous research has demonstrated that reading motivation is closely linked to students' reading behavior and this is a key for reading competence. Therefore, encouraging high levels of motivation in reading is an educational issue, not only concerning success in school but also as a value on its own. However, findings have shown interindividual differences in students' reading motivation. Thus, there is a research desideratum regarding the identification of factors which influence reading motivation and in more detail its effects on reading competence. Subsequently, the question of how students' interest can be fostered raises up. The symposium will start with a presentation of an experimental study which focuses on students' interest in reading texts depending on gender-related text characteristics with a special interest in motivational differences between male and female students. The second talk discusses the importance of home literacy environment and reading skills development for children's reading motivation in a longitudinal design. The third presentation sheds light on reciprocal effects of reading motivation, reading amount, and reading comprehension in middle school. The last talk presents a meta-analysis about reading motivation interventions with a special focus on motivational outcomes and effects on reading abilities for different subsamples. The symposium emphasizes important lines of current research from different countries on motivational aspects in reading. The concluding discussion will focus on the relevance of the findings for further research as well as for educational practice.

Students' interest in reading dependent on gender and text characteristics: an experimental study

Presenting Author: Chantal Lepper, TU Dortmund, Germany; **Co-Author:** Justine Stang, TU Dortmund University, Germany; **Co-Author:** Nele McElvany, TU Dortmund University, Germany

Reading motivation is a favorable precondition for reading performance and is a multifaceted concept. Empirical findings on reading interest, as a facet of motivation, demonstrated gender specific differences: On average, boys are less interested in reading than girls. In addition boys also underperform in reading tasks. This issue raises questions about factors which explain differences in reading interest in general and in detail with respect to gender specific differences. An experimental study with four experimental conditions was designed to identify whether students' gender and several text characteristics (students' gender, text-topic, genre and protagonists' gender) have an influence on reading interest. The sample consisted of fourth grade primary school children ($N = 518$). Students' read one of the eight systematically varied texts and answered questions concerning their interest in reading the text. The results revealed that students' gender, text-topic and text genre affected students' interest in reading texts. Regarding differences between boys and girls, male students preferred reading a text with a male attributed topic and male protagonist, while girls enjoyed reading the texts in general. The findings are discussed in terms of their significance for educational practice and research.

The role of HLE in Children's Reading Motivation across Preschool and First Grade

Presenting Author: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:** Eija Pakarinen, University of Jyväskylä, Finland

Previous research highlights the contribution of home literacy environment (HLE) to children's reading skills development. However, the effect of different factors of HLE on children's reading motivation has been investigated to a lesser extent. The aim of the present study was to investigate longitudinal associations between children's reading motivation (interest and self-concept of ability in reading), reading skills development, and HLE in a sample of 179 Finnish children across preschool and first school year. Children were interviewed on their interest in reading (four times) and self-concept of ability in reading (three times), and their reading skill (fluency) were tested (four times). In addition, mothers reported HLE activities, such as children's independent reading activities at home, shared reading with a parent and library visits. The results showed that both shared and independent reading at preschool age predicted a higher self-concept of ability in reading at the first grade. Library visits with preschool-aged child and parental education were related to a higher interest in reading at the beginning of the school. Further, children's reading skill increased their self-concept of ability in reading but did not significantly predict their interest in reading at school. The results suggest that the HLE activities at preschool age promote reading-related motivation in the first school year.

Reciprocal effects of reading motivation, reading amount and reading comprehension in middle school

Presenting Author: Kristjan K. Stefansson, Independent scholar, Iceland; **Co-Author:** Freyja Birgisdóttir, University of Iceland, Iceland; **Co-Author:** Steinunn Gestsdóttir, University of Iceland, Iceland; **Co-Author:** Hafþís Guðrún Hilmarsdóttir, University of Iceland, Iceland

This study aimed to explore the reciprocal effect of reading motivation, reading amount and reading comprehension in middle school. The mediating role of reading amount in the relationship between reading motivation and reading comprehension was also examined. Participants were 400 Icelandic ten- to twelve year-old children (55 % girls) who were assessed on task oriented reading motivation (Hamilton et al., 2016) and reading comprehension on three separate occasions with a 12 month interval; in Grades five, six and seven (mean age 10.7, 11.7 and 12.7, respectively). Reading amount was also assessed at the last two testing points. The results did not support a reciprocal relationship between reading motivation and reading comprehension. However, mastery oriented motivation significantly predicted reading comprehension growth between Grades 5 and 6, and Grades 6 and 7 and interest oriented motivation also predicted reading comprehension growth between Grades 6 and 7. These predictive relations were not mediated through reading amount. The results further revealed a bi-directional relationship between reading interest and reading amount, suggesting that not only does reading motivation enhance reading amount, reading

amount also increases reading motivation.

Effectiveness of interventions that foster reading motivation: A meta-analysis

Presenting Author:Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:**Lisa van der Sande, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Lidia Arends, Erasmus Universiteit Rotterdam, Netherlands; **Co-Author:**Suzanne Fikrat-Wevers, Erasmus University Rotterdam, Netherlands

Reading motivation is an important factor in students' reading outcomes. Motivated students read more often, use more diverse and effective reading strategies, and demonstrate better reading comprehension (Schiefele, Schaffner, Möller, & Wigfield, 2012). Consequently, it is deemed important to target reading motivation in educational interventions (Guthrie & Wigfield, 2000). Although a variety of reading motivation interventions have been developed over the years, the effects of such interventions have not yet been synthesized and compared in a systematic way. In this meta-analysis, we first aim to examine overall effects of reading motivation interventions on motivational outcomes and reading comprehension. A second objective is to analyze to what extent program effects are affected by intervention and sample characteristics. Preliminary analyses on a subset of studies (Van Steensel, Van der Sande, Bramer, & Arends, 2016) showed small positive effects on both motivation and comprehension. Additionally, we observed positive effects on motivation and/or comprehension of programs arousing students' individual or situational interest, providing autonomy support, eliciting social motivation, providing competence support, and setting mastery goals. The effect of extrinsic motivators was negative: providing external rewards resulted in smaller effects on reading motivation. In this presentation, we will discuss the outcomes of the final sample of studies, discussing both the theoretical and educational implications of our findings.

Session E 9

13 August 2019 10:15 - 11:45

Seminar Room - S01

Single Paper

Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Professional Development and Workplace Learning

Keywords: Case studies, Comparative studies, Higher education, Informal learning, Motivation, Qualitative methods, Quantitative methods, Survey Research, Teacher professional development, Workplace learning

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Trinidad Garcia, University of Oviedo, Spain

Finnish teachers' professional development on interacting with pupils

Keywords: Case studies, Informal learning, Teacher professional development, Workplace learning

Presenting Author:Lais Oliveira Leite, University of Eastern Finland, Finland; **Co-Author:**Wooryeon Go, University of Eastern Finland, Korea, Republic of; **Co-Author:**Sari Havu-Nuutinen, University of Eastern Finland, Finland

This paper investigates how Finnish experienced school teachers reflect about their informal learning focused on building positive interactions with pupils. First, the study presents how teachers perceive to learn on building positive interactions with pupils, and second it discusses how teachers apprehend this learning process. Teaching through interaction and professional agency models framed the theoretical background. A survey was applied to 48 primary school teachers. Psychometric tests were run for purpose sampling. Five teachers with the highest scores in the survey were interviewed. From participants' reports, three groups of multidimensional factors were explored: 1) professional agency factors that support teacher's learning; 2) active learning strategies used by teachers to build positive interactions with pupils; 3) personality elements that base teacher-pupil interactions. Teachers believe to constantly learn about teacher-pupil interactions and perceive that their learning do not change interactions with pupils, but rather create a general professional growth.

Teachers' perspectives on professional development: a focus group study at three Dutch universities

Keywords: Higher education, Qualitative methods, Teacher professional development, Workplace learning

Presenting Author:Margje W.J. van de Wiel, Maastricht University, Netherlands; **Co-Author:**Esther de Ponti, Tilburg University, Netherlands; **Co-Author:**Kathleen Schlusmans, Open University the Netherlands, Netherlands

Professional development programs are common in higher education and have shown positive impact on teachers and students if they are well-implemented and relate to educational practice. In 2008, the Dutch research universities agreed upon the characteristics and content of a University Teaching Qualification (UTQ) to promote the quality of university teaching. The aim was to facilitate teachers to develop competences needed to perform core teaching tasks and apply them in practice. Therefore, reflection on professional performance is central in guiding the developmental trajectory through self-assessment of UTQ competences and in portfolio assessment. In 2017, universities organized peer reviews to reflect on the quality of the programs and pinpoint issues for improvement. The present focus group study was done to include teachers' opinions about the UTQ and continuing professional development (CPD) in the peer review of three universities. In total 54 teachers participated in 9 focus groups representing all faculties. The results showed that participants valued both UTQ and CPD, if they could apply the knowledge, feedback and ideas gained to improve their teaching practice. They also valued reflection on performance as promoted by discussions with colleagues and the UTQ portfolio. High work load and balancing research and education were hindering factors in applying what was learned. To enhance teaching quality, the programs should optimize transfer to the workplace by focusing on meaningful learning on and for the job and link to the intrinsic motivation and wishes of teachers. This study provided clear guidelines to do this.

Teacher educators' work contexts, basic needs satisfaction, and their researcherly disposition

Keywords: Motivation, Quantitative methods, Teacher professional development, Workplace learning

Presenting Author:Hanne Tack, Ghent University, Belgium; **Co-Author:**Ruben Vanderlinde, Ghent University, Belgium

Grounded in the Self-Determination Theory, this study examines the relations between teacher educators' experienced work pressure and opportunities for professional growth, their work related basic needs satisfaction (i.e. autonomy, competence and relatedness) and their researcherly disposition (i.e. being a smart consumer of research, being able to conduct research, conducting research and valuing research). A large-scale survey study was conducted, involving 944 teacher educators working within teaching-intensive teacher education institutions. The results of SEM-analyses show that teacher educators' opportunities for growth as well as the experienced work pressure are significantly related to the satisfaction of teacher educators' basic psychological needs at work. In turn, positive relations were identified between the satisfaction of the basic psychological needs and teacher educators' researcherly disposition.

Teachers' career entry motivations: A comparative study from India, Spain, Finland, and England

Keywords: Comparative studies, Motivation, Quantitative methods, Survey Research

Presenting Author:Sindu George, Monash University, Australia; **Co-Author:**Gloria Gratacos, C.U. Villanueva, Spain; **Co-Author:**Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:**John Thornby, University of Warwick, United Kingdom; **Co-Author:**Ilpo Jappinen, University of Eastern Finland, Finland; **Co-Author:**Jingoo Kang, University of Eastern Finland, Finland; **Co-Author:**David Mendez, University of Villanueva, Spain; **Co-Author:**Graciela Salazar, University of Villanueva, Spain

Teacher supply is a hot topic in different country contexts. The UK faces a national teacher shortage, with thousands leaving teaching profession each year. The government's current solution is to incentivise teacher training with substantial bursaries – particularly within shortage subjects such as mathematics and science. In Indian subcontinent, although no such crisis has been reported until recently, the current changes introduced by the apex body, National Council for Teacher Education (NCTE; <http://ncte-india.org>) have negatively affected the number of students opting teacher education courses including STEM areas. In Spain, there is no global shortage of teachers, but in some subjects. Due to the economic crisis in Spain, for the last 10 years STEM professionals had to move out of the country for employment. Although Finland is known for its excellence in teacher training, lack of motivation in some subject areas, including science and mathematics has been identified as challenging for teachers to find practices that encourage students to enroll in science and technology courses in upper

secondary school. Moreover, Finland faces shortage of teachers in areas such as Physics and Chemistry as preservice teachers who study Maths or Biology are not opting to teach Physics or Chemistry. It is against this background that the current study makes a comparative analysis of preservice teachers' motivations and perceptions in these contexts using FIT-Choice framework (Watt & Richardson, 2007).

Session E 10

13 August 2019 10:15 - 11:45

Seminar Room - S13

Single Paper

Motivational, Social and Affective Processes

Achievement, Educational Psychology and Motivation and Emotion

Keywords: Achievement, Educational Psychology, Engineering, Goal orientation, Intelligence, Motivation, Self-efficacy, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Ching-Shu Chen, Taiwan

Influences of Perfectionism on New Zealand University Students' Self-Perceptions and Performance

Keywords: Achievement, Educational Psychology, Motivation, Self-efficacy

Presenting Author: Valerie Sotardi, University of Canterbury, New Zealand

Perfectionistic tendencies may determine how effectively students adjust academically and socially during schooling transitions. The current study was conducted to gain a better understanding of perfectionism and its relation to students' self-perceptions and academic performance during their transition to university. With a sample of first-year undergraduates in New Zealand ($n = 1028$), a hypothesized model predicting the influences of perfectionism on students' academic self-efficacy, subjective wellbeing, adjustment to university, and semester GPA was tested. Using structural equation modelling, results showed that (a) excessively high personal standards and parental expectations had positive influences on academic self-efficacy, (b) all dimensions of perfectionism had negative influences on subjective wellbeing, (c) excessively high concern over mistakes and high doubts about actions had negative influences on university adjustment, whereas high personal standards had a positive influence on university adjustment, and (d) excessively high parental criticism and personal standards resulted in negative and positive influences on Semester GPA, respectively. With medium to large effect sizes, our results show the complexity of perfectionism and its differential effects on how New Zealand students view themselves and perform academically during their transition to university. Educational and theoretical significance will be discussed, with a particular emphasis on how perfectionistic tendencies may contribute to academic benefits but costs to wellbeing.

Exploring changes in student-teacher agreement on goal structures

Keywords: Achievement, Educational Psychology, Goal orientation, Motivation

Presenting Author: Lisa Bardach, University of York, United Kingdom; **Co-Author:** Takuya Yanagida, University of Vienna, Austria; **Co-Author:** Barbara Schober, University of Vienna, Austria; **Co-Author:** Marko Lüftenegger, University of Vienna, Austria

Previous studies have shown that alignment between teachers' and students' perceptions of goal structures (i.e., student-teacher agreement) ranges from non-existent to, at most, moderate. However, existing work is limited in that it all relies on cross-sectional data, meaning that we lack an understanding of changes in student-teacher agreement on goal structures over time. The present study therefore (a) attempts to shed light on changes over one semester in student-teacher agreement on six dimensions of goal structures (task, autonomy, recognition, grouping, evaluation, and time) in mathematics classes. In addition, we address the question of whether (b) the first mathematics test in the semester affects changes in student-teacher agreement. Furthermore, the study (c) examines whether and how students' self-concept and indicators of students' actual achievement are (reciprocally) related to agreement and changes in agreement. Data for this study was collected at five measurement points in newly assembled classes (Grade 9) after a transition within secondary education. The sample contained 130 students and their mathematics teachers, resulting in 130 student-teacher dyads. Applying piecewise growth curve modeling indicated changes in agreement regarding recognition, evaluation, and time. Higher increases in self-concept before the test forecasted declines in agreement regarding autonomy after the test. Moreover, we found effects of achievement on changes in agreement for the dimensions of autonomy and time. To conclude, the study's findings support a dynamic view of student-teacher agreement on several dimensions and provide insights into the interplay between changes in agreement, self-concept, and achievement.

Being an Emerging Engineer in Biology Courses: Future Oriented Value, Belongingness, and Achievement

Keywords: Achievement, Educational Psychology, Engineering, Motivation

Presenting Author: Jenefer Husman, University of Oregon, United States; **Co-Author:** Matthew Graham, University of Oregon, United States; **Co-Author:** Cameron Hecht, University of Wisconsin-Madison, United States; **Co-Author:** Bobbie Bermudez, University of Oregon, United States; **Co-Author:** Mengfan Zhai, University of Oregon, United States; **Co-Author:** Judith Harackiewicz, University of Wisconsin-Madison, United States

The focus of the study was the examination of future oriented motivational constructs, and changes in those constructs over the course of a semester, in the context of a Utility Values intervention in an introductory biology course. Do students who are connected to a future goal (becoming an engineer) respond to a utility value intervention, which does not emphasize connection to the future? Is there a difference between Utility Value and future oriented utility value (Perceptions of Instrumentality)? Students' in the course were engineering majors. Motivational variables included Future Time Perspective, Perceptions of Instrumentality, Utility Value, and Belongingness in their major. Students' course grades were used to indicate achievement. Students ($N = 257$) were randomly assigned to a control group or intervention group. No mean differences were found for the motivational or achievement measures. Relationships among the baseline and change scores differed between the control and intervention groups. For both groups belongingness, future time perspective – connectedness, were related to PI but not UV. Utility value and PI were strongly related. Findings suggest the importance of considering students connections between the future and the present when developing value interventions.

Implementing intelligence facets as predictors into the generalised I/E model

Keywords: Achievement, Educational Psychology, Intelligence, Student learning

Presenting Author: Jennifer Hausen, University of Luxembourg, Luxembourg; **Co-Author:** Jens Möller, University of Kiel, Germany; **Co-Author:** Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:** Christoph Niepel, University of Luxembourg, Luxembourg

The internal/external (I/E) frame of reference model postulates that achievement influences the formation of academic self-concept (ASC) via social and dimensional comparison processes. Its recent extension as the generalized I/E model allows further domains than math and verbal achievement. However, intelligence facets as an indicator of achievement have been neglected within the GI/E model framework. Therefore, the purpose of this research is to explore the influences of three intelligence facets (verbal, numerical, figural) on domain-specific ASCs beyond grades and achievement scores. We drew on $N=423$ German students to analyze verbal, numerical, and figural intelligence, German and math achievement, self-reported grades and ASCs in four domains. We performed a structural equation model using Mplus with grades, achievement scores and intelligence facets specified as predictors and domain-specific ASCs as criteria. Positive paths were found from math, physics, German and English grade to their corresponding self-concepts. A positive path was found between physics grade and math ASC while negative paths were found from English grade to math and physics ASC and from math grade to German, physics and English ASC. The path coefficients from math achievement to math ASC as well as to physics ASC were positive; German achievement was negatively related to math ASC. Lastly, figural intelligence was positively related to math ASC, but negatively with German ASC; verbal intelligence was positively related with English ASC. Thus, intelligence, specifically figural intelligence, seems to be a valid predictor of dimensional and social comparisons beyond grades and achievement test scores.

Session E 11

13 August 2019 10:15 - 11:45

Seminar Room - S03

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Pre-Service Teacher Education

Keywords: Argumentation, Collaborative Learning, Conversation/ Discourse analysis, Emotion and affect, Higher education, Pre-service teacher education, Quasi-experimental research, Reasoning, Science education, Teacher professional development, Teaching/instruction, Technology, Video analysis

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Raija Hämäläinen, University of Jyväskylä, Finland

Validating a Simulation-Based Learning Environment Measuring Biology Teachers' Professional Vision

Keywords: Pre-service teacher education, Reasoning, Science education, Teacher professional development

Presenting Author: Maria Kramer, Ludwig-Maximilians-Universität Munich, Germany; **Co-Author:** Julia Stürmer, Ludwig-Maximilians-Universität Munich, Germany; **Co-Author:** Christian Förtsch, Ludwig-Maximilians-Universität Munich, Germany; **Co-Author:** Sonja Förtsch, Ludwig-Maximilians-Universität Munich, Germany; **Co-Author:** Birgit J. Neuhaus, LMU Munich, Germany

The quality of teachers' performance in class depends on situation-specific skills. Different, potentially transferable concepts of situation-specific skills exist in the field of diagnosing teaching situations. Blömeke et al. (2015) differentiate perception, interpretation and decision making. Interpretation can be differentiated into three aspects of professional vision (PV): description, explanation and prediction (Seidel & Stürmer, 2014). Another concept defines epistemic-diagnostic activities (EDAs) as situation-specific skills, which are used in different domains during diagnostic processes (Fischer et al., 2014). A simulation-based learning environment was developed to measure preservice biology teachers' professional vision and their ability to make decisions. Aim of this study is analysing content and construct validity of the test instrument concerning PV. Furthermore, the concepts of PV and EDAs are compared with respect to overlaps or complements. Validity was scrutinized by think-aloud interviews with 5 experts, which were transcribed and analyzed. For the comparison, the concepts of PV and EDAs were used separately for analysis and the overlap between the concepts was calculated. Content and construct validity of the simulation-based learning environment was shown. Therefore, the simulation can be used for measuring PV and fostering situation-specific skills. Additionally, we showed that both concepts, PV and EDAs, complement each other. Prospectively the results can be used for further differentiation of the concepts.

Challenges, socio-emotional expressions and emotion regulation in collaborative Learning

Keywords: Collaborative Learning, Emotion and affect, Pre-service teacher education, Video analysis

Presenting Author: Piia Naykki, University of Oulu, Finland; **Co-Author:** Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Tiina Törmänen, University of Oulu, Finland; **Co-Author:** Jaana Isohätälä, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

This study examined what kind of socio-cognitive challenges emerged during collaborative learning, how often experienced socio-cognitive challenges evoked negative socio-emotional expressions, and did the groups activate emotion regulation. The participants ($N=62$) were teacher education students in a six-week lasting mathematics course. The data included videotaping the groups' face-to-face work (87 hours) and were analysed by focusing on the different types of challenges, the emotional expression and emotion regulation that followed the experienced challenges. In this study, the socio-cognitive challenges were typically related to content understanding and task progress. Challenges in communication, the use of technical tools and task understanding were experienced least. The results show that when the challenges in technical tool use or in communication were experienced, they more often included negative socio-emotional expressions (i.e. frustration or anger) and emotion regulation than challenges related to content understanding and task understanding. The detailed case illustrations show the type of challenges, emotional expressions as well as emotion regulation. This study contributes to understanding of intertwined characteristics of socio-cognitive challenges, socio-emotional expressions and emotion regulation. The importance of supporting the groups to identify the challenges they experience in group interaction is discussed.

To debate or to play a conflict? Development of sociocognitive conflicts in two teaching strategies

Keywords: Argumentation, Conversation/ Discourse analysis, Pre-service teacher education, Quasi-experimental research

Presenting Author: Macarena Sanhueza Céspedes, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Christian Sebastián, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Josefa Smart Torrealba, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Martín Vergara Wilson, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** María Rosa Lissi, Pontificia Universidad Católica de Chile, Chile

For teacher training, a relevant and still unresolved problem is how to promote learning in topics highly related to the identity of those who learn. This, because changing one's own ideas about certain topics tensions people's identity, which can imply a cognitive, affective and social cost that is difficult to sustain (Bourgeois & Nizet, 1997/2007). We will argue that people can question and elaborate these topics by participating in complex argumentative conversations that conflict and challenge previous understandings; thus developing their ability to discuss evaluatively and reflexively with themselves (Larraín, 2017; Schwarz & Linchevski, 2007). However, contrasting perspectives is not easy. It is not always possible to participate in argumentative conversations in which perspectives are effectively conflicted, and even more difficult to collaborate in the elaboration of that conflict. There have been efforts to think and design pedagogical activities or devices that promote argumentative processes conducive to producing, sustaining and elaborating conflict. One way to respond to this difficulty can be found when considering how certain pedagogical devices favor exploring themes and ways of thinking, without these being threatening or compromising. This work will characterize, in an exploratory way, how a group of preservice teachers from a traditional university in Santiago de Chile discuss and argue when participating in an argumentative activity in two formats. We will report results in terms of controversies emergence and development while argumentating, contrasting differences between game and debate formats.

Student perceptions toward flipped Classroom: the role of the teacher

Keywords: Higher education, Pre-service teacher education, Teaching/instruction, Technology

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A trainee teacher's experience at university will help shape their future teaching practices. If the aim is to change the pedagogical strategies used by teachers, then there has to be a shift from a teacher-centered approach towards a more student-centered experience. In Flipped Classroom the student is provided more space to participate in class. However, results are varied. For learning to be effective it is essential to understand the students' level of satisfaction. The aim of this study is to understand which factors influence student satisfaction of the Flipped Classroom experience. We learned that in a Flipped Classroom setting, the role of the instructor is essential. The pre-class component (i.e. the videos and quizzes) is not enough to provide a satisfactory learning experience. Instead, it is the way in which the teacher develops and guides the practical activities in the classroom that matters most. In addition to this, and given the technology involved in a Flipped Classroom experience, the students must also have sufficient knowledge in this area. We also learnt that, given the amount of work that is involved, students who want to do as little work as possible are not satisfied with this kind of approach.

Session E 12

13 August 2019 10:15 - 11:45

Seminar Room - S05

Single Paper

Cognitive Science, Instructional Design, Motivational, Social and Affective Processes

Metacognition

Keywords: Achievement, Attitudes and beliefs, Higher education, Meta-analysis, Metacognition, Quantitative methods, Reading comprehension, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Laure Kloetzer, Switzerland

Mixed Methods? A comparison of different Judgments and Indicators for Metacomprehension

Keywords: Metacognition, Quantitative methods, Reading comprehension, Self-regulation

Presenting Author: Simone Goppert, University of Bamberg, Germany; **Co-Author:** Maximilian Pfost, University of Bamberg, Germany; **Co-Author:** Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany; **Co-Author:** Nora Neuenhaus, University of Bamberg, Germany

The monitoring of reading comprehension is termed as metacomprehension and therefore is an important ability for self-regulated reading comprehension. The procedures to assess metacomprehension are diverse and can be classified into three different methodological areas: 1. The "time point of measurement" (e.g. judgment of learning, confidence judgment), 2. The "grain size of measurement" (specific judgment, global judgment) and 3. The "indicator classes of measurement" (e.g. absolute accuracy, relative accuracy, bias). The diversity of judgments and indicators used in studies about metacomprehension limit a comparison of findings across studies and the generalizability of results. To integrate findings and simplify a comparison our study compares different judgment types and indicators with a sample of 745 secondary school students across two measurement occasions. Test-retest-reliability and the relation to reading comprehension are analyzed, too. Our results on "time point of measurement" showed that the indicators for the specific confidence judgment are mostly more accurate than the calculated indicators for the specific judgment of learning. The comparison of "grain size" reveals that global judgments are suitable for a quick gathering of information, even though they implicate less specific information. For the indicators of absolute accuracy and bias we found low to moderate test-retest-reliability. Reading comprehension was best predicted by absolute accuracy and bias at both measurement occasions.

The Effect of Self-Regulated Learning Interventions on Achievement: a Meta-Analysis

Keywords: Achievement, Higher education, Meta-analysis, Self-regulation

Presenting Author: Renee Jansen, Utrecht University, Netherlands; **Co-Author:** Anouschka van Leeuwen, Utrecht University, Netherlands; **Co-Author:** Jeroen Janssen, Utrecht University, Netherlands; **Co-Author:** Liesbeth Kester, Utrecht University, Netherlands

Students who self-regulate their learning process are metacognitively, behaviorally, and motivationally active in their learning. Self-regulated learning (SRL) is of greater importance in higher education, due to the increased autonomy offered to students. In existing studies, it is often assumed that interventions aimed at supporting students' SRL are effective for improving achievement because these interventions support SRL activity. In this study, a meta-analysis was conducted in which meta-analytic structural equation modeling (MASEM) was used to test whether SRL activity indeed mediates the effect of SRL interventions on achievement in higher education. The results of the review provide evidence for partial mediation, which means that only part of the improvement in achievement after an SRL intervention is due to changes in SRL activity. Potential explanations for the partial, as opposed to full, mediation by SRL activity are discussed, and include time on task and the quality of SRL measurements.

How much impact does growth mindset have on course grades?

Keywords: Achievement, Attitudes and beliefs, Higher education, Metacognition

Presenting Author: Jose Luis Suarez-Garcia, Colorado State University, United States; **Co-Author:** Ani Aghababayan, McGraw-Hill Education, United States; **Co-Author:** Neil Zimmerman, McGraw-Hill Education, United States; **Co-Author:** Sean Burns, Colorado State University, United States

Mindset research suggests that students who possess a growth mindset rather than a fixed mindset tend to have better academic performance. This has led many educational institutions to create programs to encourage a growth mindset. However, the actual impact of having a growth mindset on college performance is still open to some debate. Furthermore, many of the implementations to support a positive mindset have not fully teased apart the degree to which these programs work through promoting growth mindset, as compared to the other benefits these programs may have. Existing implementations also vary considerably in quality. In this paper, we use a survey instrument to measure whether a student has a growth mindset or fixed mindset, and correlate the survey responses to student grades and other outcomes. We find a small positive effect for the growth mindset group – statistically significant, but sufficiently small to question whether a growth mindset alone can be beneficial in this context. Some have hypothesized that simply giving a survey on mindset can increase growth mindset and therefore course grades. However, we found no difference in overall grades between students in the same courses during Spring 2017 semester where no growth mindset survey was administered and grades in Fall 2017 semester when a survey was given.

Session E 13

13 August 2019 10:15 - 11:45

Seminar Room - S02

Single Paper

Higher Education, Lifelong Learning

Workplace and Lifelong Learning

Keywords: Action research, Case studies, Collaborative Learning, Higher education, Interdisciplinary, Lifelong learning, Metacognition, Misconceptions, Professions and applied sciences, Qualitative methods, Self-regulation, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Anu Tammeleht, University of Helsinki, Estonia

Emerging directions in research on lab capacity strengthening for drug-resistant infections in LMICs

Keywords: Interdisciplinary, Lifelong learning, Professions and applied sciences, Qualitative methods

Presenting Author: Koula Charitonos, The Open university UK, United Kingdom; **Co-Author:** Allison Littlejohn, Open University, United Kingdom; **Co-Author:** Tim Seal, The Open University, United Kingdom, United Kingdom

The rise of antimicrobial resistance (AMR) poses a threat to our ability to treat common and life-threatening infections on a global scale. Identifying the emergence of AMR requires strengthening of surveillance for AMR, particularly in low and middle-income countries (LMICs) where the burden of infection is higher and health systems are least able to respond. Situation in LMICs is highly dependent on how well the health system in each country functions, however little is known about how to offer laboratory capacity strengthening in ways that bring about effective change. In response to this major challenge, the UK Department of Health & Social Care (DHSC) launched the Fleming Fund to support LMICs in developing AMR surveillance systems, with a direct focus on laboratory surveillance. The paper draws on the scoping phase of a four-year research study funded by the Fleming Fund, where we synthesised existing knowledge around areas of change needed to improve AMR surveillance. To achieve this, we interviewed twenty-three (n=23) experts worldwide on the views on the strengthening AMR surveillance in LMICs, on practitioners' needs in terms of subject and learning and also the broader AMR surveillance system. The paper presents this data and discusses emerging directions in research on laboratory capacity strengthening for drug resistant infections in LMICs.

Expertise related misconceptions and weaknesses in medical knowledge; a review

Keywords: Higher education, Lifelong learning, Metacognition, Misconceptions

Presenting Author: Els Boshuizen, Open University of the Netherlands, Netherlands; **Co-Author:** Kosala N. Marambe, University of Peradeniya, Sri Lanka

In this paper we explore the relation between expertise level and mistakes and errors in the knowledge base. We did that by means of a comprehensive literature review, covering the whole range of educational and expertise levels. Apart from misconceptions in biomedical knowledge (e.g., regarding the pulmonary system), we identified blind spots in the knowledge base as potential harmful for clinical practice. These blind spots seemed to result from one-sided emphasis on knowledge related to the own situation at earlier levels of training (primary and secondary education); at higher levels of expertise development

they seemed related to well-established but misperceived empirical research practices as well as false reductionistic beliefs. Though these blind spots can be seen as false beliefs, we conjecture that lack of meta-cognitive awareness and critical thinking provides a better perspective both theoretically and educationally.

Self-regulated professional learning: insights from a longitudinal field-study in clinical practice

Keywords: Case studies, Lifelong learning, Self-regulation, Workplace learning

Presenting Author:Katrien Cuyvers, University of Antwerp, Belgium; **Co-Author:**Piet Van den Bossche, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

Notwithstanding a growing interest in self-regulation of professional learning, empirical research is still scarce. If studied, offline cross-sectional self-report techniques are used to measure SRPL retrospectively. A longitudinal multiple case-study design was used, including 13 physicians of different medical specialties. Ethical approval was obtained. A multi-method approach was applied combining long-term observations offering evidence on overt self-regulatory strategies. Observable behaviors were used as cues for in-loco stimulated recall interviews, asking about metacognitive strategies and the content of thoughts regarding a situation at hand. Fieldnotes and audiotaped interviews were transcribed verbatim and integrated in a longitudinal database. The transcripts were analyzed with Nvivo 12 applying principles of content analysis and grounded theory. Results show that self-regulation of professional learning is strongly intertwined with self-regulation of performance. Also, metacognitive strategies not included in contemporary frameworks on self-regulated learning are indicated. Overt and metacognitive strategies for learning often originate in performance-goals. Overt self-regulative learning strategies used to tackle difficulties during job-performance are for example consulting colleagues and guidelines. Metacognitive awareness and monitoring are more difficult to make explicit and extract. Medical specialists often report not to know how to monitor their learning or monitor intuitively. Reflection and evaluation can hardly be deduced from the data. The study forwards a situated methodological perspective which goes beyond the path of retrospective self-report questionnaire-use and contributes to the understanding of self-regulation of professional learning in everyday practice.

Transforming campus learning landscapes - Building common ground through a service design process

Keywords: Action research, Collaborative Learning, Higher education, Workplace learning

Presenting Author:Caj Niclas Sandström, University of Helsinki, Finland; **Presenting Author:**Anne Nevgi, University of Helsinki, Finland

The future of higher education partly rests on how campus learning landscapes (physical-digital and social) are developed to meet the needs that arise in society and in working life. Learning landscape (see Harrison & Hutton, 2014) broadly refers to a view of learning environments that are part of surrounding urban landscapes and communities. Also, the developments in digitization of existing practices and digitalisation in new information technologies and practices require transdisciplinary design efforts. This study compared participatory service design processes in retrofitting (redesigning existing facilities) of campuses at two Finnish universities from the perspective of building common ground. The focus was on developing service design processes for HE learning landscape re-design. The informants were experts from facilities management, ICT and pedagogical support, service designer and interior architect. Thematic, semi-structured interviews (N= 19) were performed contextually in the pilot learning spaces, combined with notes and observations from participatory workshops. Different phases were identified in the process. One of main findings was that setting up and maintaining a trustful, open and transdisciplinary process was the essential ingredient in reaching also strategic goals. The service design processes yielded user profiles (personas) and alternative Key Performance Indicators for assessing the design process of learning landscapes.

Session E 14

13 August 2019 10:15 - 11:45

Seminar Room - S04

Single Paper

Cognitive Science, Developmental Aspects of Instruction, Instructional Design, Learning and Social Interaction

Misconceptions

Keywords: Content analysis, Conversation/ Discourse analysis, Experimental studies, Geography, Informal learning, Instructional design, Literacy, Misconceptions, Mixed-method research, Qualitative methods, Science education, Secondary education

Interest group: SIG 03 - Conceptual Change, SIG 06 - Instructional Design, SIG 09 - Phenomenography and Variation Theory

Chairperson: Nina Kolleck, Freie Universität Berlin, Germany

Processes and earthquakes - investigating Swedish students' conceptions and relational thinking

Keywords: Content analysis, Geography, Misconceptions, Secondary education

Presenting Author:Mattias Arrhenius, Stockholm University, Sweden; **Co-Author:**Cecilia Lundholm, Stockholm University, Sweden; **Co-Author:**Gabriel Bladh, Karlstad University, Sweden

The aim of this study is to investigate students' conceptions of causes, processes and consequences of earthquakes in relation to plate boundaries. We also focus on students' conceptions of earthquakes in relation to society, and why some societies are more affected than others. Data consists of 134 written responses on two assignments from the Swedish national test in geography with 12-13 year old students. The responses were sampled and then analysed using content and thematic analysis. Results show that the majority of students relate earthquakes to convergent boundaries rather than to divergent or transform boundaries, holding alternative conceptions on the processes involved. Furthermore, students often describe different geological events such as tsunami and volcanoes, but rarely explain where and how earthquakes occur. The results also show that many students have developed a geographical relational understanding on why consequences of earthquakes are more severe in poor countries by addressing socioeconomic processes including weak buildings or lack of preparedness related to poor economy, whereas some students hold alternative conceptions relating earthquakes in poor countries directly to a general increase in heat, proximity to the equator, or presence of plate boundaries in only poor countries. We believe these findings help provide insights for teachers when designing classroom instruction aiming at changing alternative conceptions and strengthening scientific understanding.

Students' explanations of river landforms and processes: a framework theory perspective

Keywords: Geography, Misconceptions, Mixed-method research, Qualitative methods

Presenting Author:Rod Lane, Macquarie University, Australia

It is generally accepted that students develop initial conceptions of physical phenomena prior to formal instruction; these conceptions play an important role in the development of deep understanding. What is subject to debate is whether these initial conceptions form coherent explanatory frameworks - "framework theories" (Vosniadou & Skopeliti, 2014), whether they are fragmented pieces of knowledge (p-prims), or simple errors. These distinctions are important as they influence how educators view students' ideas and make pedagogical decisions. This paper contributes to this debate by describing the results of a study designed to assess the nature of secondary geography students' knowledge of river processes and landforms. A mixed-method approach was used to assess the mental models of river processes and landforms held by Year 11 students studying Geography at an independent school in rural New South Wales (NSW), Australia. The study aimed to determine whether students held coherent and stable framework theories and used these to consistently explain river behaviour. Findings suggest that students' knowledge of river processes and landforms is complex and includes a combination of factual information, naïve conceptual understandings, presuppositions, ontological/epistemological commitments and scientific understandings. These knowledge elements are combined loosely to form synthetic theories which are used to explain phenomena and to make predictions across a range of contexts.

Reducing Reliance on Misinformation through Psychoeducation and an Error Marking Task

Keywords: Experimental studies, Informal learning, Instructional design, Misconceptions

Presenting Author:Steffen Gottschling, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Yvonne Kammerer, Leibniz-Institut für Wissensmedien (IWM), Germany

Abstract. Exposure to incorrect information can shape what we think to know even when we possess prior knowledge on the topic. This troublesome

phenomenon is described as the misinformation effect and has been resistant to a multitude of attempts to reduce it with different instructional interventions. In this study, we presented participants ($N = 100$) with two fictional texts containing some misinformation on different facts. Half of the sample received information on the misinformation effect before reading the texts (psychoeducation) and were instructed to mark all errors they could find in the texts (intervention group), the other half received no such information (control group). Prior knowledge regarding general knowledge questions was assessed one week before the experiment. Five minutes after reading the texts (i.e., after a filler task), participants answered another general knowledge questionnaire, among others regarding facts addressed in the texts. This allowed us to measure the proportion of misinformation reproduced after exposure to the texts for information that was answered correctly beforehand. We expected our intervention to increase deliberate processing of errors in texts and, as consequence, to reduce the misinformation effect. In line with this hypothesis, we found that participants in the control group reproduced more misinformation on items (they knew correctly beforehand) for which they were presented misinformation in the texts than for which they were presented neutral information, whereas this was not the case for participants in the intervention group. Moreover, participants in the intervention group reproduced less on misinformation from the texts than controls.

Science students' noticing of appropriate frames

Keywords: Conversation/ Discourse analysis, Literacy, Misconceptions, Science education

Presenting Author:Tobias Fredlund, University of Oslo, Norway; **Co-Author:**Erik Knain, University of Oslo, Norway

In this theoretical paper we draw on two constructs that we argue are related to the appropriate interpretation of many representations in science education: frames and structures of awareness. By representations is meant, for example, images, diagrams and models. The idea of frames is taken from social semiotics and the idea of structures of awareness is taken from the variation theory of learning. Using both an everyday example and examples from science education we make the argument that students need to become explicitly aware of tacitly held structures of awareness that frame their interpretation of representations. A task for science educators would be to investigate the possibility to produce representations that could aid students in this work.

Session E 15

13 August 2019 10:15 - 11:45

Seminar Room - S06

Single Paper

Higher Education, Teaching and Teacher Education

Learning in Higher Education

Keywords: Case studies, Communities of practice, Doctoral education, Higher education, Informal learning, Integrated learning, Lifelong learning, Pre-service teacher education, Student learning, Teacher Effectiveness, Teacher professional development, Teaching approaches

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Jori Beck, Old Dominion University, United States

Practising Fiercely: Lifting Teacher Fulfilment through Stance, Supports and Stamina

Keywords: Communities of practice, Higher education, Integrated learning, Lifelong learning

Presenting Author:Wendy Holley-Boen, Massey University, New Zealand

Teachers work within a range of personal and contextual factors that serve as enablers and barriers to their professional identity, practice and wellbeing. There is a need to explore their perspectives of the current education context, and their roles within it, to better understand the ways teachers experience and position themselves within and against the tensions posed by an increasingly complex world. This research is timely as it investigates an emerging group of professionals, specialist teachers in Aotearoa New Zealand, who integrate postgraduate study with new professional roles and the other facets of their lives. Using a participatory narrative inquiry, steeped in positive psychology and biculturally responsive practice, the present study identifies connections across identity, practice and wellbeing as knowing oneself and conceptualizing practice as relational; ecological and contextualized; challenging and requiring lifelong learning. Alongside the enablers of trust and agency, the research foregrounds the tensions of working in a system straddling special and inclusive education and other unintended barriers to professional practice. Enablers, tensions and mediating variables are unpacked with a focus on the way agentic professionals navigate their personal and professional lives. Findings from the present study informed the development of a framework for the fulfilment of teachers through fierce practice comprised of stance, supports and stamina. This framework has utility at the individual level, supporting the fulfilment of individual teachers. At the systems level, the framework may be of interest to tertiary teachers and institutions wishing to help teachers to develop and sustain meaningful and satisfying lives.

Shaping PhD students teaching conceptions through the interplay of formal and informal learning

Keywords: Doctoral education, Higher education, Informal learning, Teacher professional development

Presenting Author:Mari Karm, University of Tartu, Estonia; **Co-Author:**Triinu Soomere, University of Tartu, Estonia

Quality of teaching in higher education has become topical in recent years. Competitiveness, regional development and innovation are seen as a result of quality teaching in higher educational institutions. It has been established that teachers' conceptions about teaching and learning, and the students' learning, as the hallmark of quality of education, have a strong connection. Teaching conceptions are shaped and quality of education is enhanced in different ways – through both formal and informal learning. As today's PhD students are tomorrow's lecturers, their conceptions of teaching and learning have a role to play in the future quality of higher education. The study aimed to find out how PhD students describe both formal and informal learning of teaching skills. Initial results of the study indicated that PhD students describe formal learning in terms of gaining a conceptual understanding about teaching, various reasons that lead them to undertake courses and the impact of formal learning on their teaching perceptions and practice; informal learning is described as learning by example or learning by doing, engaging in practices of reflection and through gaining an insight about organisational values pertaining to teaching. Formal and informal learning were reported to be intertwined, and boundaries between them to be vague. It was also revealed that formal learning led to informal learning and reflection, which in turn guided towards realisations about lack of knowledge or skills. Based on the discovered shortcomings and needs, informal learning paved way to a second cycle of formal learning.

The contemporary function of the student voice in higher education: exploring the Chilean case

Keywords: Higher education, Student learning, Teacher Effectiveness, Teaching approaches

Presenting Author:Stephen Darwin, Universidad Alberto Hurtado, Chile

This paper critically considers the contemporary role and influence of the student voice in contemporary higher education. Although considerable interest has been demonstrated in the potential pedagogical influence of the student voice in school education, less attention has been given to its fundamentally distinctive function in university systems where it is primarily afforded by quantitative student ratings. Significantly, this particular manifestation of the student voice is proving increasingly attractive across systems as a means of internally measuring and regulating academic work, as well as increasingly fuelling external ranking-based comparisons of teaching effectiveness. Yet how influential is the student voice beyond these ratings in higher education practice? In order to further understand this influence, the study reported here investigated the function and influence of the student voice in the Chilean higher education system—one of the most deregulated neoliberalist university models internationally where historically students had some of the highest tuition fees in the OECD. A systematic analysis of accreditation and quality assurance approaches used in Chilean higher education. The outcome demonstrated that the actual perceived value of the student voice was largely incidental significance and had little real assumed influence on the quality and enhancement of higher education teaching practices or enhancing student learning outcomes. This suggests that paradoxically in a highly marketized higher education model strongly framed by the discourses of student choice, the actual influence of students remains marginal.

Pre-service teacher research in intended, implemented and attained curriculum of teacher education

Keywords: Case studies, Higher education, Lifelong learning, Pre-service teacher education

Presenting Author:Lidewij van Katwijk, NHL-Stenden / University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands; **Co-Author:**Klaas van Veen, University of Groningen, Netherlands

The importance of teacher preparation and the attention to the role of pre-service teacher research in this is growing worldwide. Based on prior studies we identified four main aspects with regard to the development of the pre-service teachers' research competence: 1. Research knowledge, 2. An inquiry habit of mind, 3. Research skills and 4. Application of research findings in practice. In the Netherlands, research competence in primary teacher education is developed over four years, resulting in a capstone research project in the form of practitioner research. The aim of this study is to compare the description of the four aspects of research competence in the *intended curriculum* -divided in *ideal curriculum* and *formal curriculum*-, with the *implemented*, and *attained curriculum* of primary teacher education in the Netherlands. In this curriculum study, we applied document analysis, questionnaires and panel interviews with teacher educators and pre-service teachers of eight institutes. Preliminary findings show that the aspect 'research skills' is best developed in the *formal* and *implemented curriculum*, although 'an inquiry habit of mind' is seen as the most important aspect in the *ideal curriculum*. For the *attained curriculum* pre-service teachers indicated to have learned to conduct research and to see the value of pre-service teacher research. Remarkably, they also mentioned not to expect to conduct (practitioner) research in their future teaching job. Explanations for this might be the lack of a research-oriented culture and knowledge in most primary schools, or the formal way of conducting research in the teacher education program.

Session E 16

13 August 2019 10:15 - 11:45

Seminar Room - S11

Single Paper

Assessment and Evaluation

Assessment Methods and Tools in Higher Education

Keywords: Assessment methods and tools, Cognitive skills, Collaborative Learning, Higher education, Learning analytics, Peer interaction, Quantitative methods, Reasoning, Self-regulation

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Timo Leuders, University of Education Freiburg , Germany

Advancing peer assessment in higher education [ASSET: Erasmus+ co-funded project]

Keywords: Assessment methods and tools, Collaborative Learning, Higher education, Quantitative methods

Presenting Author:Dorit Alt, Kinneret College on the Sea of Galilee, Israel; **Co-Author:**Nirit Raichel, Kinneret College on the Sea of Galilee, Israel

Peer assessment (PA) is the application of criteria to evaluate and provide feedback on the work of peers or colleagues. Due to the scant work done thus far, the present longitudinal study assessed students' perceptions of and attitudes towards PA and their effect on the perceived *Transfer* of PA practices to their future classes. 120 undergraduate multicultural Education students have participated the study. The students were given two group-assignments in line with the project-based approach. During each project presentation to the class, the students were required to individually assess each other's group work based on an indicator that was previously designed in collaboration with the teacher. After each assessment, the students filled out a questionnaire (*Check 1* = after the first PA, *Check 2* = after the second PA). The questionnaire measured students' perceptions of and attitudes towards PA and included four factors: The first, *Them-to-Me* is focused on the perception of other students' skills to evaluate my work; the second, *Me-to-Them* is related to the student's perception of his/her ability to assess others; the third deals with transferring the assessment role to the teacher (*Teacher-centered assessment*); and perceived *Transfer*. The only significant result was in the factor *Them-to-Me* in which a lower mean score was indicated for *Check 2* than *Check 1*. Further analysis showed that this result was associated only with minority students. A regression analysis showed that both factors: *Them-to-Me* and *Me-to-Them* have positively contributed to students' willingness to transfer PA practices to their future classes.

Using Learning Analytics to Identify Efficient Indicators for Grading Group Essays

Keywords: Assessment methods and tools, Collaborative Learning, Higher education, Learning analytics

Presenting Author:Mei-Shiu Chiu, National Chengchi University, Taiwan; **Co-Author:**Ya Ping (Amy) Hsiao, Tilburg University, Netherlands

The aim of this study was to identify efficient indicators for group essay grades. The research participants were 18 students registering in a teacher-training course using an instructional design of face-to-face and digital blended learning. The course required the students to design, implement and evaluate a teaching program using creative pedagogical designs. Students wrote a complete essay in groups to address the teaching programs as their teachers' research. Four sets of indicators relating to the group essay grades generated from the course process. Two sets of indicators came from normal course practices: (A) group essay grades assessed by the instructor, peers and group members and (B) students' other course grades or behaviors (i.e. multiple assessments) including students' knowledge test results, essay grading management behaviors, weekly journals, and attendance. Two sets of indicators were generated from digital log data because the group essay was completed through an online co-editing system: students' group essay (C) commenting behaviors and (D) version histories and behaviors. The data were analyzed by the Kruskal-Wallis analysis of variance and Spearman's rank correlation. The results indicated that the instructor's group essay grades highly related to group essay grades assessed by outgroup peers, online group comment frequencies, and online group comment interaction loop sizes. The instructor's group essay grades had median relationships with students' essay grading management behaviors and essay grades by group members. The results suggest efficient indicators of group essays and likely indicators to help adjust group essay grades for individual students.

Co-regulated learning in dialogic peer feedback

Keywords: Assessment methods and tools, Higher education, Peer interaction, Self-regulation

Presenting Author:Qiyun Zhu, Guangdong University of Foreign Studies, China

There exists an emerging interest in the theoretical connection between peer feedback and co-regulation, yet empirical evidence of the connection is scarce. This study aims to occupy this niche by probing into students' multiple peer feedback experiences in an English as a foreign language writing curriculum of a Chinese university. An ethnographically oriented research design was adopted. Data were collected through class observation, reflective journal and interview. A thematic analysis of the data shows that co-regulation occurred among the student reviewer, the receiver and their teachers. The receiver co-regulated the reviewer in language, writing skill and assessment capability. The reviewer co-regulated the receiver in terms of audience awareness and generation of idea. Furthermore, they both regulated the teachers' assessment practices and feedback literacy. A framework of co-regulated dialogic peer feedback was proposed to capture the interplay between the three social roles in the process. The study contributes to feedback research by delineating the cyclical and multi-dimensional dynamic co-regulatory processes among the social players.

Assessment of reasoning skills at the beginning of higher education studies

Keywords: Assessment methods and tools, Cognitive skills, Higher education, Reasoning

Presenting Author:Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:**Erzsébet Korom, University of Szeged, Hungary; **Co-Author:**Gyongyver Molnar, University of Szeged, Hungary

Scientific reasoning is one of our most complex cognitive processes, it involves many other thinking skills such as general problem solving and inductive reasoning. However, there is a lack of empirical research on investigating all the three constructs in parallel. The aim of the study is to explore the relationship between scientific reasoning, problem solving and inductive reasoning and to examine the predictive power of inductive reasoning and problem solving on scientific reasoning at the beginning of university study. The sample for the study was drawn from students starting higher education studies in a large university of Hungary (N=1729; Mean age=19.8; SD=2.1; 50.7% female). The scientific reasoning test comprised 19 items dealing with identifying and handling variables (Cronbach's alpha=.88; M=66.7%; SD=23.9). The problem solving tasks were based on the MicroDYN approach (alpha=.88; M=57.3%; SD=21.8).

The inductive reasoning test consisted of figural and numerical items (series and analogies) ($\alpha=.84$; $M=62.8\%$; $SD=15.5$). Instruments were administered online in the university library via the eDia platform. Scientific reasoning correlated positively with both problem solving and inductive reasoning: $r=.42$ and $r=.38$ respectively (p

Session E 17

13 August 2019 10:15 - 11:45

Seminar Room - S12

Single Paper

Assessment and Evaluation, Motivational, Social and Affective Processes

Emotion and Affect

Keywords: Collaborative Learning, Emotion and affect, Motivation and emotion, Primary education, Quantitative methods, Science education, Self-efficacy, Self-regulation, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Martin J. Tomasik, University of Zurich, Switzerland

A Structural Model of the Relationship among Meta-Affect, Self-Efficacy, and Science Achievement

Keywords: Emotion and affect, Science education, Self-efficacy, Student learning

Presenting Author: Esen Uzuntiryaki Kondakci, Middle East Technical University, Turkey; **Co-Author:** Zubeyde Demet Kirbulut, Harran University, Turkey

The purpose of this study was to test a model which investigated 8th grade students' science achievement by the relationship between meta-affect and self-efficacy. A total of 536 8th grade students from public secondary schools participated in the study. Meta-Affective Trait Scale and the Motivated Strategies for Learning Questionnaire were used to determine students' meta-affective inclinations related to their emotions in science classes and their self-efficacy beliefs in science, respectively. In addition, their science scores of the national exam were used for their science achievement. Results of structural equation modelling indicated that science achievement was predicted by the relationship among meta-affect variables and self-efficacy. Affective awareness, affective regulation, and self-efficacy accounted for 27% of the variance in science achievement. These findings suggest that teachers should encourage students to realize and regulate their emotions so that they develop high self-efficacy beliefs, which in turn have potential to increase their achievement. This study provides an empirical support for the role of meta-affect and self-efficacy in achievement.

How mistakes can benefit learning

Keywords: Emotion and affect, Motivation and emotion, Primary education, Student learning

Presenting Author: Nicholas Garnett, Keele University, United Kingdom; **Co-Author:** Yvonne Skipper, Keele University, United Kingdom

When learning to read, children engage with many learning opportunities in which they may make mistakes. For example, every time a child decodes a grapheme into a phoneme there are opportunities for mistakes. Children who perceive these challenges as non-threatening and as an opportunity to learn are more likely to develop their skills and knowledge faster than their peers. This adaptive response to failure is considered a key component of a growth mindset. However, there has been limited field work exploring how a positive response to failure can influence young children's educational performance. Here we show that pupils who have a positive affective response to failure and feel more positive about persisting following failure achieve more in phonics, sentence reading, and reading comprehension. The data we present are from a wider study which evaluated an intervention designed to enable teachers to promote growth mindsets. Year 1 primary school pupils completed measures at the beginning and end of the academic year. This included reading assessments and instruments which measured their affective response and persistence following a hypothetical failure. Our results provide support for the hypothesis that how pupils respond to failure, both affectively and in terms of persistence can be beneficial for their learning. Therefore, we suggest that understanding how teachers create 'mistake friendly' classroom environments merits future research.

When emotion regulation emerges in collaboration? - Relation to valence and physiological arousal

Keywords: Collaborative Learning, Emotion and affect, Motivation and emotion, Self-regulation

Presenting Author: Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Tiina Törmänen, University of Oulu, Finland; **Co-Author:** Kristiina Kurki, University of Oulu, Finland

Prior research on the co- and socially shared regulation of emotions indicates that emotion regulation is an inherent part of collaborative learning. Little is known, however, of the different emotional indicators that could signal the possible need for the emotion regulation in the situation. This study aims to explore the association between actualized group level emotion regulation, and observable emotional valence and physiological arousal. The participants were 31 12-year old students performing a collaborative science task in small groups. The study implemented video and physiological data to explore the conditions in which group level emotion regulation, composed of co- and socially shared emotion regulation, emerges. Emotional valence of collaborative learning situations was captured from video data. Electrodermal activity data was collected from each student to capture the group members' physiological arousal in the same situations. The results show that group level emotion regulation is associated with negative group level valence. Concerning the physiological arousal, the results revealed that emotion regulation is more probable to emerge when at least one group member is in a high arousal state. The results further indicate that group level emotion regulation requires both a need for regulation, identified through the visible signs of negative valence, and physiological activity, identified through the physiological arousal of some group members. To conclude, this type of process-oriented approach utilizing more than one data channels could offer possibilities for systematic analysis that integrates emotion regulation with the temporal analysis of regulated learning more expansively from bigger data corpus.

Anxiety and Hope Interact with Regulation Strategies close to an Exam

Keywords: Emotion and affect, Quantitative methods, Self-regulation, Student learning

Presenting Author: Anna-Lena Rottweiler, Augsburg University, Germany; **Co-Author:** Ulrike Nett, Augsburg University, Germany

Students preparing for an exam experience various emotions. Hereby, an effective emotion regulation is important, in order to ensure for instance psychologically healthy behaviour and an effective learning progress. However, the question occurs how emotions, like exam-related hope and anxiety, and emotion regulation strategies influence each other over time. By examine these dynamics we will gain more insight in students' emotion regulation close to an exam. Therefore, this experience sampling study measured university students' emotions and emotion regulation strategies (cognitive approach, cognitive avoidance, behavioural approach, behavioural avoidance) during two different weeks of assessment. In total, 217 students answered a questionnaire 6 times a day over 7 days twice prior to exams (5 weeks and one week before). Data was analysed by applying dynamic multilevel models. Results show autocorrelations for both emotions and emotions regulation strategies. Results further reveal a causal effect of exam-related hope to cognitive approach and a causal effect from behavioural approach to exam-related hope. The proximity in time to the exam seems to have an effect on the strength of autoregressive effects and direction of cross-lagged effects. This study shows the importance of regarding context when examine emotion regulation.

Session E 18

13 August 2019 10:15 - 11:45

Seminar Room - S15

Single Paper

Motivational, Social and Affective Processes

Motivation and Emotion

Keywords: Attitudes and beliefs, Collaborative Learning, Cooperative/collaborative learning, Culture, Educational Psychology, Motivation, Motivation and

emotion, Out-of-school learning, Quantitative methods, Quasi-experimental research, Second language acquisition, Secondary education, Video analysis

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Miriam Losse, Saxion University of Applied Sciences, Netherlands

Testing the Gap Hypothesis: Longitudinal Relations between Digital Engagement and School Engagement

Keywords: Educational Psychology, Motivation and emotion, Out-of-school learning, Quantitative methods

Presenting Author: Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland; **Co-Author:** Kai Hakkarainen, University of Helsinki, Finland; **Co-Author:** Kirsti Lonka, University of Helsinki, Finland

The gap hypothesis suggests that students who prefer learning with digital technologies outside school are growing less engaged in traditional school. We tested this gap hypothesis with longitudinal data. It was of interest, how digital engagement, consisting of general digital learning preference (DLP) and demand for digital school engagement (DSE) is related to traditional school engagement (EDA) first cross-sectionally in three time points and second, longitudinally across three years. The participants were 1705 (43.7% female) participants from 27 schools in the Helsinki area (7th grade to 9th grade). Out of these, 1090 participated in at least two time points over the data collection period and 530 participated in all the waves. The participants filled in a self-report questionnaire in T1, T2 and T3. We tested the gender and time invariance of the measurement model using longitudinal confirmatory factor analysis approach (CFA). Then, we explored the gender-controlled cross-sectional undirected relations between the latent constructs. To evaluate the longitudinal relations between digital engagement and EDA we specified a latent longitudinal panel model (L-CLPM). First, we estimated the L-CPLM with all structural paths specified between successive time points T+1 and T+2. Second, latent interactions between DLP and DSE at T were included as predictors of EDA at T+1. Both the cross-sectional and longitudinal results showed support to the gap hypothesis: although DLP was directly related to higher EDA, students who preferred digital learning but did not experience having the chance to digitally engage at school, experienced decline in schoolwork engagement over time.

Exploring Goal Complexes: Achievement Goals, Reasons for Performance Goals, and Emotional Correlates

Keywords: Attitudes and beliefs, Culture, Motivation and emotion, Second language acquisition

Presenting Author: Jeannine Turner, Florida State University, United States; **Co-Author:** Jinjushang Chen, Florida State University, United States; **Co-Author:** Juhee Kim, Florida State University, United States

For Chinese students learning English in China ($n=270$), we found three predominant groups, based on their ratings of Achievement Goals. The first group we labeled the Typical Student group; they endorsed moderate levels on all achievement goals ($n=159$). The second group we labeled the Ideal Student group; they indicated high endorsement of mastery-approach goals as well as performance-approach goals ($n=56$). The third group we labeled the Goal Conflict group; they indicated high endorsement on all achievement goals (mastery-approach, performance-approach, mastery-avoidance, performance avoidance, $n=45$). Across the groups, students expressed significantly different reasons for having performance goals (autonomous/controlled) as well as different levels of hope for success and fear of failure, self-efficacy and language-learning anxiety, and pride or shame for succeeding, or failing, to perform better than others. Logistic regressions showed that predicting student-placement in the Typical Student group was best characterized by their lack of willingness to engage in competitive situations. Membership into the Ideal Student group was best predicted by their autonomous reasons for engaging in competition, but they did not experience pride associated with performing better than others. Membership in the Goal Conflict group was predicted by their anxiety and their shame if they did not perform better than others. The overall tests suggested that all three models fit the data well with 75%, 76% and 87% correct predication rate, respectively.

Motivation co-construction: How students build group-level motivation in collaborative learning

Keywords: Collaborative Learning, Motivation, Motivation and emotion, Video analysis

Presenting Author: Kayley Lyons, Monash University, Australia; **Co-Author:** Nikki Lobcowski, University of North Carolina at Chapel Hill, United States; **Co-Author:** Jeff Greene, University of North Carolina, United States; **Co-Author:** Jacqueline E. McLaughlin, University of North Carolina at Chapel Hill, United States

The purpose of the study was to characterize motivation co-construction in two collaborative small groups. First, I developed a framework for motivation co-construction by adapting constructs from knowledge co-construction and socially-shared regulated learning. Then, I observed and coded for motivation co-construction mechanisms in video tapes of two groups working together. In an entrepreneurship course, pharmacy students worked on a collaborative project to solve a variety of authentic ill-defined health care problems. The two groups included a group in which all members rated their motivation high throughout the group project and a group in which most members rated their motivation average to start and low at the end of the semester. Data collection included ten video sessions throughout a semester. I and another researcher coded for constructs deductively and conducted open-coding for emerging constructs. The results indicate that the proposed motivation co-construction mechanisms fit the data and were useful for explaining qualitative differences between the two groups. The students built group-level agreement for task difficulty beliefs, task value and costs, competence perceptions, causal attributions, achievement goal orientations, social goal orientations, value for group member's ideas, motives, and group identity. The final codebook will contribute to future research measuring group-level motivation constructs.

Effects of an intervention on personal and social competences of adolescents

Keywords: Cooperative/collaborative learning, Motivation and emotion, Quasi-experimental research, Secondary education

Presenting Author: Dölf Looser, Institut für Professionsforschung & Kompetenzentwicklung, Switzerland

In recent years, more and more have been referred to programs that in contrast, for example, to "Faustlos," unite the promotion of educational and personal goals.

The study addresses this objective and refers to the key competences - personal and social - in the new curriculum for German-speaking Swiss cantons ("Lehrplan 21"). The aim of this research contribution is to demonstrate the effect of two interventions focusing on respect, common rules and group dynamics on the bundle of dependent variables such as peer relationship, empathy as well as assertiveness, perseverance, and learning and achievement motivation of 7th grade pupils. In the investigation, (2017-2018), a total of 10 secondary school classes ($n = 217$, experimental group) and 6 secondary school classes ($n = 90$, control group) participated in the study by filling out a questionnaire. The above mentioned bundles of dependent variables were collected in this quasi-experimental design (three measuring points, experimental and control group) in the 2nd / 3rd school week, after the first quarter (9th / 10th week) and at the end of the school year. Significant longitudinal interaction effects including experimental and control groups can be demonstrated in a theory confirming manner.

Session E 19

13 August 2019 10:15 - 11:45

Seminar Room - S07

Single Paper

Higher Education

Teaching and Learning in Student-centred Learning Environments

Keywords: Assessment methods and tools, Attitudes and beliefs, Competencies, Content analysis, Higher education, Qualitative methods, Secondary data analysis, Social aspects of learning and teaching, Student learning, Teaching approaches

Interest group: SIG 04 - Higher Education

Chairperson: Crina Damsa, University of Oslo, Norway

Student hesitancy to active participation in student-centred learning environments

Keywords: Higher education, Secondary data analysis, Social aspects of learning and teaching, Student learning

Presenting Author: Monika Nerland, University of Oslo, Norway

This paper examines challenges related to student participation in student-centred learning environments by examining reasons for hesitancy to participate and take on responsibilities as envisioned by the teacher. Explorative and knowledge-generating activities are seen as generally supportive to learning, but imply at

the same time that students take greater responsibilities for their own work and learning processes. Research has shown that it has proved challenging to engage all students in productive ways through these approaches and that quite a few students are disengaged rather than engaged as anticipated (Hockings 2009, Baeten et al. 2016). However less is known about students' reasons for not engaging as encouraged by the teachers or anticipated in the course designs, or about what constitutes sources of hesitancy. Therefore, this paper aims at exploring how extended responsibilities for the accomplishment of learning activities are experienced by students and the forms of reluctance and uncertainty that occur. The paper draws on comprehensive descriptive reports of eight higher education courses studied within a large research project, in which activities and experiences were documented based on participant observation, interviews and various course materials. The paper conducts a secondary analysis of these reports with a specific focus on challenges to participation as expressed by students and how these generate hesitancy. Challenges to participation of cognitive, social, affective and temporal kinds are revealed, and discussed in relation to features of the learning environments in which they arose. The paper concludes by discussing implications for quality work in higher education practices.

Perceptions of quality feedback- depending on contextual factors?

Keywords: Assessment methods and tools, Attitudes and beliefs, Higher education, Qualitative methods

Presenting Author:Trine Fosslund, UiT The Arctic University of Norway, Norway; **Co-Author:**Odd Rune Stalheim, Inland Norway University of Applied Sciences, Norway; **Co-Author:**Rachelle Esterhazy, University of Oslo, Norway

Literature has shown that students and teachers in different higher education settings often perceive quality of feedback in various ways. Based on the idea that the discipline is relevant for the way students and teachers perceive teaching and learning in higher education, we argue that the perceived quality of feedback is related to the specific teaching-learning environment it is embedded in. To that end, this paper explores what students and teachers perceive as quality feedback in their course and how this is related to their perceptions of their own teaching-learning environment. We draw on interviews with students and teachers from three different courses that vary in their discipline and pedagogical approach. The findings show that the criteria for what counts as quality feedback vary across course contexts and between students and teachers. Differences were related to the importance attributed to certain structural, epistemic and relational-affective characteristics of the course environment. The paper illustrates that the institutional work with evaluating and developing the quality of feedback does not take place in a vacuum and that we therefore need to find more context-sensitive ways of approaching this challenge.

Law students' perceptions of legal reasoning

Keywords: Competencies, Content analysis, Higher education, Student learning

Presenting Author:Anne Haarala-Muhonen, University of Helsinki, Finland; **Co-Author:**Heidi Hyytinen, University of Helsinki, Finland; **Co-Author:**Tarja Tuononen, University of Helsinki, Finland

This study explores law students' perceptions of legal reasoning among the bachelor level law students in a large research intensive university. Altogether 30 students were interviewed. The participants comprised three student groups: the first (n=10), second (n=10) and third (n=10) year students. The data were analysed by using a qualitative content analysis. In the analysis, three categories of legal reasoning were detected. The first category consisted of versatile descriptions of legal reasoning with concrete examples of the students' legal reasoning and they had a clear picture of legal problem solving process. The second category consisted of descriptions in which students describe their legal reasoning problem solving narrowly and they mentioned some key elements of legal reasoning. Whereas the third category consisted of perceptions that showed students' having difficulties in describing their legal reasoning and it appeared that their legal problem solving relied on common sense. The results showed that students' perceptions of legal reasoning varied among first, second and third year students. The third year students were able to provide more detailed and coherent perceptions of their legal reasoning than the first and the second year students. The results imply that the development of legal reasoning needs to be facilitated systematically during university studies.

Pedagogical designs fostering student engagement in group-based learning

Keywords: Higher education, Qualitative methods, Student learning, Teaching approaches

Presenting Author:Crina Damsa, University of Oslo, Norway; **Co-Author:**Anne Line Wittek, University of Oslo, Faculty of Education, Norway

This study departs from a general acknowledgement that collaborative activities in small groups are productive for students' learning. A range of so-called 'student-centered' approaches include elements of group work, in which students are required to engage in collaborative investigations, problem solving or knowledge co-construction. However, what it means for teachers to organize and support such learning in this way, how students engage in collaborative learning activities, what they experience as challenging, and what support they might need, is to an extent overlooked in research on learning in higher education. This chapter uses observations, interviews with teachers and students, course documents and findings from case studies in two higher education courses, wherein group work was a prevalent activity that spanned several weeks, to identify aspects that matter for the quality of collaborative learning in small group settings. Furthermore, the chapter highlights ways in which such learning activities *are* and *can be* pedagogically designed, organized and enacted in order to support student engagement.

Session E 20

13 August 2019 10:15 - 11:45

Seminar Room - S14

Single Paper

Higher Education, Learning and Social Interaction

At-risk Students and Higher Education

Keywords: At-risk students, Communities of learners, Computer-supported collaborative learning, Content analysis, E-learning/ Online learning, Higher education, Informal learning, Knowledge creation, Problem solving, Problem-based learning, Qualitative methods, Student learning

Interest group: SIG 04 - Higher Education, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Baerbel Fuerstenau, TU Dresden, Germany

Master students' experiences of using Design Thinking for solving an authentic challenge

Keywords: Content analysis, Higher education, Problem solving, Student learning

Presenting Author:Ebba Berggren, The Royal Institute of Technology (KTH), Sweden; **Co-Author:**Maria Weurlander, The Royal Institute of Technology (KTH), Sweden; **Co-Author:**Niall Seery, Athlone Institute of Technology, Ireland

The method "Design Thinking" is used in higher education and in schools as a way to develop students' skills and competences needed to manage and solve complex societal and environmental challenges. Implementations of the method in business and teams shows positive effects, yet the method is critiqued from design professionals. The aim of this study was to understand master students experiences of the method Design Thinking during a working process. Data was gathered by means of interviews and observations during a course that uses Design Thinking as its primary course structure and working method. A thematic analysis was made by researchers with expert knowledge in education, design and Design Thinking. The analysis showed that students adhered to the method in different ways at different times. The prescribed process and the students own process to solve the challenge were in conflict. The students' experience of the method was in constant negotiation, from skeptical reflections to acknowledging benefits. Findings from the study suggests that learning to solve a challenge by following a method gives both support and hindrance. By recognizing how prescriptive process methods interact with students own processes, we may gain a more multifaceted understanding of them as tools for learning; both for prescription, guidance and inspiration.

Influence of Media Consumption during Studies on University Dropout Rates

Keywords: At-risk students, Higher education, Informal learning, Knowledge creation

Presenting Author:Hans Anand Pant, Humboldt Universitaet zu Berlin, Germany; **Co-Author:**Judith Jitomirski, Humboldt-University Berlin, Germany; **Co-Author:**Carla Kühling-Thees, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität

Mainz, Germany; **Co-Author:**Jasmin Schlax, Johannes Gutenberg-University Mainz, Germany; **Co-Author:**Roland Happ, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany

The present study investigates the media consumption of first-year students and the relationship to them dropping out or changing their study subject. The study focuses on business and economics (B&E) as the most studied subject worldwide. Additionally, many B&E-related topics are frequently addressed in news coverage. A Germany-wide large-scale pre-post-measurement with a subsample of 709 participants was used for the presented results. Of those, 620 students self-reported continuing their B&E studies, while 89 dropped out of university completely or changed their study subject after the first study year. The results compare the consumption of and trust in media of those two groups. The findings suggest that dropouts and subject changers consumed course materials (textbooks, lecture notes) less frequently when preparing for courses and/or exams and showed less trust in them. This effect was supported even when controlling for interest in B&E topics additionally impacting exam preparation. These findings show a discrepancy between subjectively felt interest of students who drop out or change their study subject and their actual frequency of gathering information about B&E. The results highlight the importance of educational institutions providing students with services that bridge the gap between subjective interest and actual knowledge about the subject.

The role of social support in students' transition to university: The case of problem-based learning

Keywords: Communities of learners, Higher education, Problem-based learning, Qualitative methods

Presenting Author:Patrick Bijmans, Maastricht University, Netherlands; **Co-Author:**Jeanine de Bruin, Maastricht University, Netherlands; **Co-Author:**Afke Groen, Maastricht University, Netherlands

The transition of students from secondary school to higher education is a much debated subject – both in society, where the costs of dropping out of university may be high, and in academia, where scholars have studied the subject of student transition and persistence in the first year from many different angles. In this context, social integration is an important, but often ignored, factor. Some research has emphasised the supportive academic and social environment that active learning environments can offer. Yet, the importance of such active learning environments for social integration and the transition from high school to university has not been researched extensively. In this paper we address this gap by looking into the role of social support in the transition to a PBL environment at Maastricht University. After conceptualising various elements of students' social environment in higher education, we report on the findings of semi-structured interviews with students. We explore how they perceive the role of social support both inside the university context – such as in scheduled lectures and tutorials, and in informal interaction outside the university context – such as interactions with or commitments to friends in study associations, sports clubs and work. The implications for staff and university's support services in an active learning environment are discussed.

Online education as an effective solution to integrate refugees into higher education

Keywords: At-risk students, Computer-supported collaborative learning, E-learning/ Online learning, Higher education

Presenting Author:Roland Happ, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Franziska Reinhardt, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Tobias Deribo, Johannes Gutenberg Universität Mainz, Germany; **Co-Author:**Sarah Nell-Müller@uni-mainz.de, Johannes Gutenberg Universität Mainz, Germany

One potential approach to integrating refugees into higher education is free digital learning (FDL) based on MOOCs (e.g. Castaño-Muñoz et al. 2018). In this study, we explore the extent to which there are opportunities for refugees to participate in higher education via MOOC platforms, irrespective of their country of residence and external study conditions. The results show significant differences in the refugees' external conditions (e.g. time to study or internet connection) depending on their host countries, which influences the opportunities and limitations of MOOC-based integration approaches. The study environments differ significantly between the four major host countries (Germany, Jordan, Turkey, and Kenya) included in this study. For instance, the technical prerequisites for an online study program differ strongly, which in turn affects the use of online programs. The results indicate that despite the high study motivation of $n=1025$ surveyed refugee students, limited external conditions (e.g. technical infrastructure) significantly hinder active participation in the online program examined in this study. The study presented here is based on data from the online education initiative Kiron Open Higher Education (Kiron). The analyses indicate an urgent need to re-design MOOC-based programs in order to successfully integrate refugees into higher education regardless of where they are currently located.

Session E 21

13 August 2019 10:15 - 11:45

Seminar Room - S09

Single Paper

Cognitive Science

Mathematics and Neuroscience

Keywords: Cognitive development, Cognitive skills, Mathematics, Neuroscience, Numeracy, Reasoning

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Signe Tonér, Stockholm University, Sweden

The neural correlates of numerical order processing and their relationship to arithmetic performance

Keywords: Cognitive development, Mathematics, Neuroscience, Numeracy

Presenting Author:Stephan Vogel, University of Graz, Austria; **Co-Author:**Gerrit Sommerauer, Karl-Franzens-Universität Graz, Austria; **Co-Author:**Karl-Heinz Graß, University College of Teacher Education Styria, Austria; **Co-Author:**Roland H. Grabner, University of Graz, Austria

In the past years, there has been a large interest to better understand the neurocognitive foundations of numerical abilities and their relationship to mathematical performance. While most of the existing literature has focused on the brain correlates of numerical magnitude processing (i.e., the number of elements in a set), little is currently known about the neural correlates of numerical order processing (i.e., the relative rank or position of a numeral within a sequence) and their association to arithmetic performance. To investigate this relationship on the level of the brain, a total of 25 children from elementary school were asked to complete a numerical order task (are the numbers going up? e.g., 1-2-3) and a numerical magnitude task (which is the larger number? e.g., 5 7) while we measured their brain activation with functional magnetic resonance imaging (fMRI). Arithmetic performance was assessed with an arithmetic paper-pencil test outside the scanner. Results of this study showed that behavioural performance of both tasks was significantly correlated with arithmetic fluency. However, the relationship between numerical magnitude and arithmetic was fully mediated by numerical order. On the level of the brain, a significant dissociation between the neural correlates of numerical order and numerical magnitude processing was observed. While brain activation of the numerical order task was significantly associated with arithmetic performance, no such association was found for numerical magnitude. These findings provide evidence for the unique and important role of numerical order processing and its relationship to arithmetic performance in typically developing children.

Neural correlates of number mapping in elementary school children

Keywords: Cognitive skills, Mathematics, Neuroscience, Numeracy

Presenting Author:Courtney Pollack, Massachusetts Institute of Technology, United States; **Co-Author:**Anila D'Mello, Massachusetts Institute of Technology, United States; **Co-Author:**Dayna Wilmot, Massachusetts Institute of Technology, United States; **Co-Author:**Isabelle Frosch, Massachusetts Institute of Technology, United States; **Co-Author:**Rachel Romeo, Massachusetts Institute of Technology, United States; **Co-Author:**Andrea Imhof, Massachusetts Institute of Technology, United States; **Co-Author:**Karolina Wade, Massachusetts Institute of Technology, United States; **Co-Author:**Jimmy Capella, Massachusetts Institute of Technology, United States; **Co-Author:**Tracy Centanni, Massachusetts Institute of Technology, United States; **Co-Author:**Kelly Halverson, Massachusetts Institute of Technology, United States; **Co-Author:**John D. E. Gabrieli, Massachusetts Institute of Technology, United States; **Co-Author:**Joanna A. Christodoulou, MGH Institute of Health Professions; Massachusetts Institute of Technology, United States

The development of mathematical competence requires the ability to understand and work with digits. Digit processing includes the ability to map quantities across formats, such as matching digits to nonsymbolic representations like arrays of dots. Prior research has shown that the ability to map quantities across

symbolic and nonsymbolic formats is better in adults versus children, and in older versus younger children (e.g., 8 versus 6 year olds), reflecting the learning that occurs over developmental time (Emerson & Cantlon, 2012). Additionally, mapping ability correlates with mathematics competence (e.g., Mundy & Gilmore, 2009), and elicits brain activation in a fronto-parietal network (Emerson & Cantlon 2012, 2015). Whether age-related differences in mapping efficiency exist in children across elementary school years (i.e., 8-12 year olds), and whether functional activation of brain regions that support mapping relates to mathematics competence in this age group, is unknown. The current study examined behavioral performance and the functional neural correlates of numerical mapping, and their relation to calculation skills, in typically developing children 8-12 years old. Participants completed a standardized measure of calculation and a numerical mapping task during neuroimaging (fMRI). Results showed that mapping response time was correlated with age (negatively), but not accuracy (which was high overall). Children showed functional activation in fronto-parietal regions during quantity mapping, consistent with prior research with younger children. Standard scores on the calculation task correlated with matching accuracy, but not brain activation. Results suggest that numerical mapping is a mechanism relevant to mathematical competence in later elementary school.

Congruency and gap effects in fraction comparison by expert young adults

Keywords: Cognitive skills, Mathematics, Neuroscience, Reasoning

Presenting Author:David Maximiliano Gomez Rojas, Universidad de O'Higgins, Chile; **Co-Author:**Pablo Dartnell, Universidad de Chile, Chile

Fractions, and rational numbers more generally, are symbolic representations of ratios of integer quantities. Many students fail to understand this conceptual aspect of fractions and are thus prone to several well-documented misconceptions. One of them relates to claiming that a fraction is large if the natural numbers forming it are large, and vice versa. A pattern of responses where this happens is said to show congruency effects between fractions' magnitudes and their components' magnitudes. In a fraction comparison task, items can be classified depending on whether congruency leads to the correct or to the incorrect answer. In addition, items can be classified according to other intuitions or strategies that students might use, for instance gap thinking: a strategy that infers which fraction is larger than the other by counting how many pieces each of them is missing to complete the whole. In this work, we investigated the effects of the congruency and gap dimensions in young mathematical experts' responses in a fraction comparison task, and specifically how these dimensions modulate the effect of numerical distance. Fifty-four undergraduate Engineering students answered a timed fraction comparison task, where congruency and gap were experimentally manipulated. Results showed that participants' accuracies and response times were affected by numerical distance (typically considered as a hallmark of participants' access to the proportions underlying the fractions), but that this effect was largely modulated by congruency and gap effects.

Session E 22

13 August 2019 10:15 - 11:45

Seminar Room - S16

Single Paper

Higher Education, Motivational, Social and Affective Processes

Achievement, Emotion and Affect

Keywords: Achievement, Culture, Emotion and affect, Goal orientation, Learning approaches, Motivation, Motivation and emotion, Science education, Self-efficacy, Self-regulation, Video analysis, Writing/Literacy

Interest group: SIG 08 - Motivation and Emotion, SIG 12 - Writing

Chairperson: Jeffrey DeVries, Technical University of Dortmund, Germany

Are Concepts of Achievement Emotions Universal Across Cultures? A Semantic Profiling Approach

Keywords: Achievement, Culture, Emotion and affect, Motivation and emotion

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Author:Elisabeth Vogl, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Klaus R. Scherer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-**

Author:Johnny J. R. Fontaine, Ghent University, Belgium; **Co-Author:**Cristina Soriano Salinas, University of Geneva, Switzerland

Studies such as the PISA 2012 and 2015 assessments document substantial differences in self-reported mean levels of achievement emotions across cultures. To date, it remains unclear whether such variation is at least partially due to cultural differences in semantic concepts of achievement emotions. To shed light on this issue, the present study compared Canadian, German, Colombian, and Chinese university students' ($N_{Total} = 126$) perceptions of affective, cognitive, motivational-behavioral, physiological, and expressive characteristics of 16 achievement emotions (e.g., joy, pride, relief, anxiety, frustration, disappointment) using the Achievement Emotions CoreGRID ($k = 84$ features), a psycholinguistic tool for examining semantic concepts of emotion terms from a multicomponent perspective. Cross-cultural agreement quantified through double-entry intraclass correlations on the full 84-feature profiles of all 16 emotions examined was generally high, ranging from .73 (Canada-China) to .88 (Canada-Germany). Agreement was particularly consistent for comparisons between Canadian and German students. However, the results also point to cultural differences, particularly for boredom. Emotion component-level analyses suggest that deviations in achievement emotion concepts are largely due to cultural differences in perceived physiological and expressive characteristics of emotions. Implications for theory and future cross-cultural research on achievement emotions are discussed.

Performing during a presentation: The role of self-efficacy, enjoyment, and cortisol

Keywords: Achievement, Emotion and affect, Self-efficacy, Video analysis

Presenting Author:Tobias Ringeisen, Berlin School of Economics and Law, Germany; **Co-Author:**Tobias Eckart, Goethe-Universität Frankfurt am Main,

Germany; **Co-Author:**Wubamlak Endale, Goethe-Universität Frankfurt am Main, Germany; **Co-Author:**Kristina Klug, Goethe-Universität Frankfurt am Main,

Germany; **Co-Author:**Marco Schickel, Berlin School of Economics and Law, Germany; **Co-Author:**Sonja Rohrmann, Goethe-Universität Frankfurt am Main,

Germany

High self-efficacy may reduce emotional and physiological stress responses while enhancing performance during presentations. The current study investigated how reported enjoyment and cortisol develop over the course of a presentation, and whether intensity and changes in these responses are associated with self-efficacy and the presentation performance. Based on an adapted protocol of the Trier Social Stress Test (TSST), 126 students (85 women) participated in a mock job interview. They prepared and delivered a 5-min presentation, detailing why they should be chosen for their dream job. Self-efficacy was assessed before the TSST (t1). Participants reported enjoyment before (t2) and after the instruction (t3), and after the presentation (t4). Salivary cortisol samples were collected from t2 to t4, and after recovery (t5). All presentations were video-taped and then rated by three raters with regard to dominance, performance, and expressed enjoyment. Data were analyzed by latent growth curve modeling. Greater self-efficacy predicted higher levels of reported enjoyment which, in turn, decreased until t4; greater pre-instruction levels were related to a steeper decline. Cortisol levels decreased from t2 to t3, and then increased until t5. The decline in reported enjoyment was associated with a pre-to-post-instruction decline in cortisol, and with lower ratings for dominance and performance. Pre-instruction cortisol levels were negatively associated with expressed enjoyment. In conclusion, high self-efficacy may foster reported enjoyment in the lead up to a presentation, while emotional and physiological stress responses may differentially dampen behavioral performance and expressed enjoyment during the presentation.

Better grades through better planning? Achievement goals, goal planning effort, and exam performance

Keywords: Achievement, Goal orientation, Motivation, Self-regulation

Presenting Author:Martin Greisel, University of Augsburg, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

University students typically have to prepare for exams over a period of several weeks. Goal-setting is generally known to foster this kind of self-regulated

learning because it guides subsequent learning and monitoring processes, but often is not executed explicitly. Consequently, prompting planning behavior, e.g., through online diaries, appears to be a promising way to improve goal-setting and learning processes of students. Additionally, individual achievement goals might affect the way students plan specific goals since their varying preferences for different end states can theoretically be expected to facilitate a different focus on the learning process. In this study, we investigated how the effort invested in planning weekly goals during exam preparation was related to achievement and how this effort depends on goal preferences. To this end, we conducted a study within the last five weeks preceding an exam. Weekly, 128 students answered a questionnaire in which they had to plan their goal for the next week. Structural equation modelling indicated that exam performance was predicted by the extent of goal planning which, in turn, was associated with time invested into planning. Moreover, time spent was positively predicted by learning-approach goals. These findings can be explained by a more thorough implementation of the forethought phase in the cyclical phases model of self-regulated learning (Zimmermann & Moylan, 2009). As such, this emphasizes the importance of achievement goals and goal setting for self-regulated learning. Practically, the scaffolding and training of extensive goal planning and learning-approach goals could be considered to promote exam performance.

Learning by doing

Keywords: Achievement, Learning approaches, Science education, Writing/Literacy

Presenting Author: Esther Odilia Breuer, Universität zu Köln/ University of Cologne, Germany

In Germany, universities usually do not provide preparatory classes for students in their first semester. It is presupposed that pupils have learned at school how to work in the academic context, which is usually not the case. Only few learn how to read texts in an academic way, how to evaluate the contents provided or how to work with the text they find. This paper introduces findings on a teaching approach taken at a German gymnasium. The teachers prepared the future students by providing them with a guidebook on academic practice. Additionally, teachers integrated academic methods in their teaching schedule in various subjects and practiced them there. Whether this was successful in the field of working with secondary literature was then tested. The pupils got two texts for summarising. They were also given two summaries of another text for evaluation. They had to explicitly state which aspects one needs to take into account when writing a summary.

The group was divided. One group started with recalling the learned concepts of summary writing, the second with evaluating the summaries, and the third with writing their own summary. We wanted to see whether the explicit activation of stored knowledge by recalling the rules or by evaluating the (good and the bad) work of others would lead to better results. However, the results showed that the group scored best that started the task with writing their own summaries. Why this was (or might have been) the case shall be discussed in the presentation.

Session E 23

13 August 2019 10:15 - 11:45

Seminar Room - S10

Single Paper

Instructional Design, Motivational, Social and Affective Processes

Achievement

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Developmental processes, Doctoral education, Instructional design, Mathematics, Motivation and emotion, Problem solving, Reading comprehension, Student learning, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 04 - Higher Education, SIG 06 - Instructional Design

Chairperson: Ayelet Becher, Ben-Gurion University of the Negev, Israel

Is generating oral explanations more effective than writing explanations? Text difficulty matters

Keywords: Achievement, Instructional design, Student learning, Teaching/instruction

Presenting Author: Leonie Jacob, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:** Andreas Lachner, University of Tübingen, Germany; **Co-Author:** Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Generating explanations is regarded as an effective instructional method to support students' learning. Recent research investigated effects of the modality of explanations (oral vs. written form), however, produced only mixed findings. One reason might be, as the used learning material considerably differed among the studies, that the text difficulty may moderate the effect of generating written versus oral explanations. To test this hypothesis, we conducted an experiment, in which university students ($N = 115$) learned from a high-difficult text and a low-difficult text in the domain of biology. Afterwards, students randomly generated a written or an oral explanation of the learning material. Additionally, a control group of students recalled the information of the text. For the low-difficult text, we found no differences among experimental conditions. For the high-difficult text, however, explaining orally was more effective than writing an explanation. Students who recalled the material showed the lowest learning gains. Serial mediation analyses revealed that the effect of oral explanations was mediated by distinct audience adjustments within the instructional explanations, as oral explanations contained more personal references which led to conceptual richer explanations. Together, our results are in accordance with cognitive load theory, as they suggest that the effectiveness of oral explanations depends on the text difficulty of the learning material. Furthermore, they propose that audience adjustments play a key role in the effectiveness of learning by explaining.

Exploring the culture of motivated persistence for Chinese graduate students

Keywords: Achievement, Attitudes and beliefs, Doctoral education, Motivation and emotion

Presenting Author: Karen Ngeow, The University of Hong Kong, Hong Kong; **Co-Author:** Yoon San Kong, CCGSS, Hong Kong

Dropout is a silent epidemic affecting graduate students across study levels and cultures. Research indicates support systems (e.g., mentoring, peer support groups) can be of tremendous help to students struggling to complete their dissertations. Nevertheless, even with support systems in place, keen and able graduate students often find themselves losing motivation and focus. This research points out the interaction between Chinese graduate students' motivated persistence and sociocultural expectations and also highlights the need for insight into the culture of learning groups to gain a more in-depth understanding of the culture of motivated persistence. The study was conducted over eight months and used survey, semi-structured interview and focus group to elicit data from 16 Hong Kong Chinese graduate students on what factors drove them to stay motivated throughout the dissertation completion process. Findings indicate that for these students, the force seen as reason to persevere is closely linked to obligation to family and how they are perceived in connected social communities. The individual student's reference for success is intricately linked to the public image that they "have made it" and did not therefore "lose face" in the eyes of significant others. It is hoped that this study exploring Chinese graduate students' motivated persistence will yield useful information for academic advisors and institutions aspiring to support students' drive and need to succeed in this academic endeavor.

Development of calculation, word problem solving and reading comprehension skills from grades 3 to 9

Keywords: Achievement, Mathematics, Problem solving, Reading comprehension

Presenting Author: Kaja Mädamürk, Tallinn University, Estonia; **Co-Author:** Eve Kikas, Tallinn University, Estonia; **Co-Author:** Piret Soodla, Tallinn University, Estonia

The study aimed to investigate different skill profiles in Grades 3, 6 and 9 taking into account students calculation skills, word problem solving skills and reading comprehension skills. As well, developmental trajectories between skill profile groups of Grade 3 to 6 and Grades 6 to 9 were investigated. The sample consisted of 789 students (52% boys) from 31 schools in Estonia. Students calculation, word problem solving and reading comprehension skills were tested at the end of Grades 3, 6 and 9. Person-oriented methods were used to analyze skill profiles and transitions from one profile group to another. The results indicated that there were high, average and low skill lever groups in each grade, but also groups with skills at distinct levels. Students who had high skills in Grade 3 tended to remain in the similar skill group over the years. However, there were also students who changed skill groups over the years indicating that more person-oriented studies are needed to investigate development of math skills.

The impact of heterogeneity on students' development using different heterogeneity measures

Keywords: Achievement, Assessment methods and tools, Developmental processes, Reading comprehension

Presenting Author:Stefanie Dotzel, University of Mannheim, Germany; **Co-Author:**Karina Karst, University of Mannheim, Germany; **Co-Author:**Natalie Foerster, University of Münster, Germany; **Co-Author:**Elmar Souvignier, University of Muenster, Germany; **Co-Author:**Karin Hebbeker, University of Muenster, Germany

Dealing with students of different abilities in class is a topic of major importance in educational research and practice. While a number of strategies have been implemented to reduce class heterogeneity, neither the theory nor the state of research can provide a clear picture about its' effects on the development of students' achievement. Previous studies primarily used the standard deviation to measure heterogeneity and mostly examined linear relationships. In this longitudinal study, we investigate both linear and non-linear effects of different heterogeneity measures on students' progress using data from 2625 students from 135 classes. We applied a longitudinal multilevel regression analysis using four levels: 1) measurement point, 2) student, 3) class, and 4) school. We ran separate models for reading fluency and reading comprehension. Results of multi-level regression analyses revealed no effect of heterogeneity measured by the standard deviation and the range and significant negative effects of the coefficient of variation and the squared standard deviation on students' development in reading comprehension and reading fluency. Further, results indicate that the average class level is way more relevant for the prediction of students' development in reading fluency/reading comprehension than the heterogeneity itself. We thus detect, that the Matthew-effect does not only appear at the individual, but also at the class level. However, the non-linear analysis underpins, that class heterogeneity influences individual development. Thus, students of equivalent pre-test values show higher development in either very homogeneous or heterogeneous classes.

Session F 1

13 August 2019 12:00 - 13:30

Lecture Hall - H04 - Knorr-Bremse Hörsaal

SIG Invited Symposium

Instructional Design

SIG 14: Potentials of Simulations Across Professions

Keywords: Educational Psychology, Higher education, Instructional design, Learning Technologies, Professions and applied sciences, Vocational education

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Helen Jossberger, University of Regensburg, Germany

Organiser: Helen Jossberger, University of Regensburg, Germany

Discussant: Andreas Rausch, University of Mannheim, Germany

This symposium brings together four empirical studies that made use of different simulations in diverse professional domains including nursing, gardening, maritime navigation, political decision-making, and mountain rescuing. In their talks, the researchers will introduce computer-based programmes, role-play, and dummies as examples of simulations. These simulations have in common that they replace and amplify real experiences with guided ones that evoke or replicate substantial aspects of real work situations in an interactive fashion. Simulations can be a way to develop and assess knowledge, skills, and attitudes. The advantage is that simulations offer a safe and controlled setting, in which learners can make errors that do not result in severe consequences. On the contrary, errors can function as source for learning. The realistic scenarios and equipment allow for retraining and practice until one masters the procedure or skill. Simulations can also mitigate ethical tensions and resolve practical dilemmas. We will address questions on how to design simulations, how simulations can foster learning, how to analyse performance data, and what the implications are of our findings so far. In our symposium, the discussant will aim to identify potentials of simulations across professions and will point out weaknesses that need further attention. In this joint endeavour, we critically reflect on whether and in which situations simulations are effective ways to support professional learning and development. Simulations may offer an additive benefit to the traditional didactic instruction, enhance performance, and possibly help reduce errors. Recommendations for future research on simulation-based learning will be offered.

Expanding Apprentices' Experiences in the Digital World

Presenting Author:Catharine Oertel, École Polytechnique Fédérale de Lausanne, Switzerland; **Co-Author:**Kevin Kim, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:**Jennifer K. Olsen, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; **Co-Author:**Pierre Dillenbourg, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Vocational Education in Switzerland is mainly a dual system. This means that apprentices work four days a week in a company and only one day a week in school. This often creates a gap in students' perception of the relevance of theory they learn at school and its relation to the practical work in the company. The DUAL-T project aims at using technologies to reduce this gap. In the current talk, I am going to focus on two technologies we developed in this context and the research behind it. The first is focused on an interactive story application, in which nurse apprentices can train their communication skills for difficult situations with patients. The second one is a VR application for gardener apprentices. Both applications share that they are based on the "Erfahrungsraum Theory", and are aimed at starting from including apprentices own experiences and expanding them on a social and time axis.

Authenticity, role-play and simulation: In-scenario corrections in maritime training

Presenting Author:Charlott Sellberg, University of Gothenburg, Sweden; **Co-Author:**Hans Rystedt, University of Gothenburg, Sweden

Drawing on an interaction analysis of video recorded data from a maritime navigation course, this presentation aims to explore potential dilemmas between sustaining authenticity through role-play in simulations and the needs for in-scenario corrections. Two episodes from the empirical data are presented suggesting that the instructors' corrections during role-play might not be heard as corrections by the students. Moreover, the presentation shows how the instructors' practice of leaving the role-play in order to clarify corrections shifts the focus of the activity: from the professional realm to the educational context. Our conclusion is that these movements are important for simulation training to fulfil its pedagogical potential.

How participating in a role-play simulation contributes to students' self-efficacy development

Presenting Author:Dorothy Duchatelet, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**Peter Bursens, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium; **Co-Author:**Pieter Spooren, University of Antwerp, Belgium

There is still a need to better understand how role-play simulations of political decision-making, in which students act out the roles of real political actors, contribute to student learning. Previous research has shown that students vary in how their self-efficacy for negotiating develops. However, how different aspects, related to personal, social, or situational conditions, contribute to self-efficacy development remains unclear. This paper wants to increase our understanding of the simulation process and of how which aspects contribute to self-efficacy development. To this aim, a single longitudinal case study was conducted. Triangulated data was collected using diaries, repeated interviews, and semi-structured observations. Twenty-seven meaningful events that result in an increase or decrease of self-efficacy for negotiating were identified after applying a set of inclusion criteria. Findings identified several aspects related to personal, social, or situational factors. Overall, results point to the interplay of these factors influencing self-efficacy for negotiating development.

Simulation as Assessment Tool for Mountain Rescuers (Non-)Technical Skills

Presenting Author:Stefan Hanus, University of Regensburg, Germany; **Co-Author:**Helen Jossberger, University of Regensburg, Germany; **Co-Author:**Michael Scheumann, University of Regensburg, Germany; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Mountain rescuers are facing more medical emergencies than ever. Emergencies are stressful situations, in which rescuers have to react quickly and apply technical skills (TS) as well as non-technical skills (NTS). TS are necessary to execute a specific medical task like chest compression or ventilation during cardiopulmonary resuscitation (CPR). NTS are all cognitive, social and personal resources that complement TS. In simulations, mountain rescuers can be trained, so that they are prepared for an emergency. The aim of this study was to assess their overall performance in a simulation setting and investigate the impact of NTS on TS. Moreover, the influence of other independent variables like experience, the effect of patient deaths and the accuracy of their assessment

were examined. Participants were 103 mountain rescuers. They were videotaped while performing CPR on a digital simulation mannequin. Questionnaires, observations and data of the simulation mannequin were used. Results showed a significant positive influence of NTS on TS. The number of simulated resuscitations had a significant positive influence on NTS. The number of experienced patient deaths did not have a significant influence on NTS. Mountain rescuers were able to assess the NTS of their colleagues correctly, but not their TS. The results of this study shed a light on the various factors that influence the resuscitation performance of mountain rescuers, which in turn can be used to gain a deeper understanding of the important parts that are needed to create effective learning and training environments for mountain rescuers.

Session F 2

13 August 2019 12:00 - 13:30

Lecture Hall - H08

SIG Invited Symposium

Instructional Design

SIG 2: Scary and exciting! Emotional and motivational factors in learning from multimedia documents

Keywords: Comprehension of text and graphics, Emotion and affect, Goal orientation, Instructional design, Motivation, Motivation and emotion, Multimedia learning, Reading comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Mireille Betrancourt, University of Geneva, Switzerland

Organiser: Alexander Eitel, University of Freiburg, Germany

Organiser: Janina Lehmann, Ulm University, Germany

Discussant: Ulrike Nett, Augsburg University, Germany

In recent years, affective and motivational factors played an increasing role in research about learning from multiple sources and representations. The issues discussed in this symposium are twofold: First, how can we design instruction to enhance motivation and positive, activating processes? Second, what is the impact of the learners' motivational or affective states on learning from multiple texts or multimedia documents?

Following the design approach, Cyril Brom questions the hypothesis according to which adding 'emotional design' elements elevate positive affective states thereby improving learning. The paper presents and discusses the results of a series of 13 experiments conducted in his lab in Prague, in which various emotional design elements were manipulated. Endres and colleagues tested the hypothesis that the positive effect of emotional design elements was mediated by increased situational interest. They compared students' situational interest and learning outcomes when learning from a neutral or an emotionally enhanced explanatory video. Following individual difference approach, Schoor and colleagues investigated to which extent students' achievement goal orientation, an established component of individual motivation, affected comprehension from multiple documents. In the fourth presentation, Kühl and Münzer demonstrated that the multimedia effect (improvement of learning performance when pictures are added to text) disappeared with learners who have an aversion for the topic to-be-learned (here: about spiders), with a follow-up investigating viewing behavior. Finally, Ulrike Nett will offer a discussion of the main findings, issues and future avenues to advance the understanding of the relationships between learning from multiple and multimedia documents and motivational or affective states.

The hunt for elusive 'emotional design' elements in instructional multimedia: The Czech case.

Presenting Author:Cyril Brom, Charles University, Czech Republic; **Co-Author:**Vít Šisler, Faculty of Arts, Charles University, Czech Republic; **Co-Author:**Tereza Hannemann, Charles University, Czech Republic

Little is known about what 'emotional design' elements in learning environments elevate positive-activating, affective-motivational states of learners and thereby facilitate learning. The present work reviews all 13 experiments examining effects of various 'emotional design' elements conducted in Advanced Multimedia Learning Laboratory in Prague, which is the only lab systematically studying multimedia learning in the Czech Republic. The studies reported generally null/mixed results as concerns affective-motivational variables as well as learning outcomes, with a notable exception of a manipulation combining role-play with a game goal (i.e., the intervention either included both of these elements or none of them). These results tentatively point in two directions. First, in certain cases, there may be language/cultural differences: what is instructionally effective in one language/cultural context may not work in a different context. The example is a conversational style of instructional texts and graphics with anthropomorphisms, which do not seem to work in the Czech context, but do work in some other contexts. Second, effects of certain 'emotional design' elements may be generally weak/mixed. The example is certain game-based elements, such as points and praise. Altogether, the results suggest that instructionally effective 'emotional design' elements are more elusive than previously hoped.

Emotional Design and Video-Based Learning: situational Interest as a mediator for persistence

Presenting Author:Alexander Eitel, University of Freiburg, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Steffen Weyreter, University of Freiburg, Institute of Psychology, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Emotional design is a factor supplementing multimedia research in the last years. Multiple studies have found beneficial effects of emotional design on affective-motivational processing of instructions, but not often on better learning outcomes overall. Therefore, in this study we test one important boundary condition for beneficial effects of emotional design on learning outcomes, namely the duration of the learning episode. Specifically, we test the hypothesis that emotional design is beneficial for learning, but only for the later phases of studying. This learning benefit is mediated via triggered and maintained-situational interest. To test the hypotheses, 79 students took part in a two-group between-subject design. Students in the neutral condition learned from a video design that followed cognitive design principles; students in the emotional design condition learned from a sketched explanation video, which was based on the neutral video but was enriched with emotional design elements (e.g., personalized frame story; warm colors; tender voice). In line with the hypothesis, the emotional design led to more positive feelings towards the materials (triggered situational interest), leading to a higher maintained-situational interest (higher perceived value of contents) that in turn fostered performance in the third and final study phase, but not in the two previous ones. The results suggest that positive effects of emotional design are to be found especially (or only) in prolonged study situations, in which motivational factors may play a more critical role. They thus provide a potential explanation for mixed effects from previous research in this study field.

The relationship of achievement goal orientations and multiple document comprehension

Presenting Author:Cornelia Schoor, University of Bamberg, Germany; **Co-Author:**Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Nina Mahlov, Leibniz Institute for Educational Trajectories (LifBi), Germany; **Co-Author:**Ulif Kroehne, DIPF, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany

The ability to successfully understand, represent, and work with multiple documents (multiple document comprehension, MDC) is a key competence in today's society. Achievement goal orientations (GOs) can influence both the process of dealing with multiple documents and MDC performance by shaping students' perception of a task and their goal-setting. In the present study, 310 university students filled in a questionnaire on GOs and worked on an MDC test. During their work on the test, they could highlight text passages and comment on the margin, which was taken as process indicators. Moreover, they reported on their mental effort during work on the test. Both a variable-centered and a person-centered approach were chosen for investigation. In the variable-centered approach, mastery approach GO significantly predicted MDC skill, which was partially mediated by effort. Performance approach GO had an indirect effect on MDC via effort. Controlling for effort and process indicators, performance avoidance GO also positively predicted MDC skills. In the person-centered approach, a latent class analysis of GOs indicated three classes with participants in the class "mainly mastery goals" showing the lowest MDC performance, participants in the class "multiple goals" showing the highest MDC performance, and participants in the class "approach goals" being in between. There were no differences in

effort or in the process indicators. The results indicate that GOs play a role for MDC, but how exactly they shape the process is to be examined further.

When a Picture may Not be Worth a 1000 Words: Emotional Aversive Pictures in Multimedia Learning

Presenting Author:Tim Kühn, University of Mannheim, Germany; **Co-Author:**Stefan Münzer, Universität Mannheim, Germany

There is ample empirical evidence that learning with text and pictures is more beneficial compared to learning with only text, which is also referred to as the multimedia principle. This superiority of text and pictures over text is particularly true for textual information that is depicted in the picture. In the present study, it was investigated whether the multimedia principle would also apply when spider fearful participants (SFs) would learn about different spider species. Since SFs usually try to avoid processing pictures of spiders, it was hypothesized that the beneficial effect of pictures would vanish for SFs, but not for nonanxious control participants (NACs). 121 university students were randomly assigned to either a text-only condition or a text-and-picture condition and were classified as SFs (32 participants) or NACs (89 participants), respectively. Results revealed that in line with the hypotheses, the beneficial effect of text and pictures over text – for textual information that was depicted in the picture – was only true for NACs, but was not observable for SFs. These results points to the possibility that well-established multimedia principles may not hold true when the content is perceived as aversive. In a follow-up study, whose results are intended to be presented at the EARLI 2019, we want to conceptually replicate this study and additionally gain insights in the underlying processes by assessing participants gaze behavior.

Session F 3

13 August 2019 12:00 - 13:30

Lecture Hall - H11

Symposium

Teaching and Teacher Education

Support teachers with the challenges of technology-integration

Keywords: Educational Psychology, Educational technology, In-service teacher education, Metacognition, Pre-service teacher education, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Andreas Lachner, University of Tübingen, Germany

Organiser: Iris Backfisch, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany

Discussant: Dominik Petko, University of Zurich, Switzerland

Educational technologies offer many possibilities to scaffold students' learning during classroom instruction. However, previous research has shown that teachers often do not fully exploit the potential of educational technologies in the classroom (Harris, Mishra, & Koehler, 2009). Which barriers constrain teachers' implementation of technology during teaching and how teachers can be supported to implement technology in an effective manner is still an open question. Aims of this symposium are twofold: First, we present descriptive studies, which investigate external (i.e., teacher training: Adnan, Tondeur, & Scherer) and internal barriers (i.e., teachers' professional knowledge and motivational beliefs: Backfisch, Lachner, Hische, Loose, & Scheiter) of teachers' technology-use and their effects on instructional quality. The second part of the symposium comprises studies, in which researchers examine the effectiveness of both minimal-invasive prompting interventions (Wekerle & Kollar) and longitudinal professional development programs (Kramarski & Moradof) to attain teachers' professional growth. The findings of those studies are jointly discussed in terms of their application in teacher education (Petko).

Technology in teacher education? A profile analysis of Turkish teacher educators

Presenting Author:Jo Tondeur, Vrije Universiteit Brussel, Belgium; **Co-Author:**Müge Adnan, Muğla Sıtkı Koçman University, Turkey; **Co-Author:**Ronny Scherer, University of Oslo, Norway

Teachers are challenged to adopt new ways of teaching, integrate technology effectively into their classrooms, and teacher education institutions (TEI) are expected to prepare future teachers to teach with technology. This study aims to explore ICT profiles of teacher educators in a Turkish state university in order to understand the personal, pedagogical, and organizational factors affecting technology use in teacher education based on latent profile analyses. Twelve teacher educators (six from each profile) were interviewed focusing on technology integration in teacher education classrooms, attitudes towards technology integration in teacher education, and factors facilitating effective technology integration for a more profound insight into participants' experience as teacher educators. Data were analyzed on the basis of a thematic framework outlining strategies for preparing pre-service teachers to integrate technology into their future classrooms, and initial findings focused on teacher educators' classroom stance as role models for pre-service teachers for effective technology use, importance of techno-pedagogical knowledge for designing technology-enriched learning environments or effectively using ICT applications in specific educational settings, collaboration with peers, authentic technology applications and avoidance of using technology regardless of pedagogical concerns, technology-enhanced assessment, professional development of teacher educators as a crucial undertaking by universities, attitudes about technology's role in education, ICT competency and awareness.

Effects of Teachers' Professional Competence on Technology-Enhanced Teaching Quality

Presenting Author:Iris Backfisch, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Christoff Hische, University of Tuebingen, Germany; **Co-Author:**Frank Loose, University of Tuebingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Throughout digitalization, technology-enhanced teaching becomes increasingly important. Despite the high expectations towards technology in the classroom, however, recent research documented that technology is rarely used in the classroom. One reason for these findings could be that teachers lack the necessary "skills and will" (Petko, 2012) to integrate technology in the classroom. Previous research, however, was primarily based on distal frequency indicators (e.g., self-reported technology usage), but not on quality indicators (e.g., instructional quality, potential exploitation), and rarely investigated potential teachers' inter-individual professional knowledge and motivational beliefs. In this contribution, we therefore examined the effects of teachers' professional knowledge and their motivational beliefs on the quality of mathematics lesson plans. Mathematics teachers (N = 93) differing systematically in their general teaching experience (i.e., pre-service, induction and in-service teachers) were asked to provide one technology-enhanced lesson plan on the Pythagorean Theorem. Additionally, we assessed their professional knowledge (i.e., content knowledge, pedagogical content knowledge, technological knowledge) and their motivational beliefs (i.e., perceived utility of technology, self-efficacy). We found that experienced teachers generated more cognitively activating lesson plans and exploited the potential of technology more than in-experienced teachers. Mediation analyses demonstrated that the effect of teaching experience was mediated by teachers' motivational beliefs (i.e., utility of technology usage), but not by teachers' professional knowledge. The findings suggest that rather than their professional knowledge, teachers' motivational beliefs impacted the quality of their instruction. Thus, teacher-education programs should additionally consider teachers' motivational conditions as central boundary condition of teaching quality.

Using scripts to enhance pre-service teachers' technology-related reasoning skills

Presenting Author:Christina Wekerle, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Many teachers show deficits in the way they use digital technology in classroom. One reason might be teachers' insufficiently developed internal technology-related reasoning scripts, i.e. their ability to reason about the ways in which digital technology might be used to support student learning. These internal scripts might lack important components (completeness) as well as be not adequately structured (sequential quality). In order to develop these internal scripts, the use of external scripts (prompts) might be promising. However, little is known to which degree different external scripts varying in their level of detail have differential effects on the completeness and sequential quality of internal technology-related reasoning scripts. Therefore, N=82 pre-service teachers were randomly distributed across four different external script conditions that varied in the level of detail of the support they provided students with, and were asked to state their approach when reasoning about technology-supported teaching scenarios before and after a case-based reasoning intervention. The results show significant pre-posttest effects for the completeness and sequential quality of the internal scripts, but no differential effects of the external script level. Results will be

discussed on the basis of additional analyses regarding students' learning processes and post-performance tests.

Simulation practice using real actors: Changing teachers' beliefs about technology integration

Presenting Author:Bracha Kramarski, Bar-Ilan University, Israel; **Co-Author:**Yafitt Moradof, Bar Ilan University, Israel

Empirical studies show that teachers have difficulty designing technology-integrated lessons for student-centered learning, thus supporting teachers to change their pedagogical practice is a challenge faced in teachers' professional development. This study describes how teachers' pedagogical change can be supported through integrating two major conceptual frameworks – professional vision (PV, noticing, reasoning, suggesting alternatives) and self-regulation of learning (SRL) by implementing a *unique simulation-based real actors' model*, eliciting an active teaching experience closely modeled on real pedagogical scenarios for changing teachers' PV and SRL beliefs in student-centered learning and self-efficacy for integrating technology into the lesson. Three groups of teachers (n = 113; grade 5) were compared in blended –technology environment learning, that included viewing, analyzing and discussing video-taped lessons followed by debriefing and discussing teaching/learning processes (30 h'). One group practiced PV with the combined SIM-SRL model (SIM-SRL group) supported by self-question prompts, while the other practiced PV only with the simulations (SIM group), both were compared to a control group. The findings indicated that after exposure to the SIM-SRL training model, teachers' professional vision increased and their pedagogical beliefs tended more to favoring student-centered learning than the other two groups. Teachers also showed the strongest beliefs in their self-efficacy oriented technological integration, that was in turn manifested in their lesson design favoring student-centered learning. The control group's gains were inferior to those of the two simulation groups. The current study adds new perspectives regarding curricula and practices for both preservice and in-service teachers.

Session F 4

13 August 2019 12:00 - 13:30

Seminar Room - S11

Single Paper

Motivational, Social and Affective Processes, Teaching and Teacher Education

Motivation in Teaching and Instruction

Keywords: Educational Psychology, Learning disabilities, Mathematics, Mixed-method research, Motivation, Primary education, Problem solving, Reading comprehension, Secondary education, Teacher professional development, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Lara Forsblom, ISPA-Instituto Universitário, Portugal

On the Relation between Students' Intrinsic Reading Motivation and Book Reading

Keywords: Educational Psychology, Mixed-method research, Motivation, Teaching/instruction

Presenting Author:Franziska Locher, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Sarah Becker, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Maximilian Pfost, University of Bamberg, Germany

In comparison to primary students, secondary students are often less motivated to read. A low motivating literature class is one aspect which is often discussed in this regard. Based on book data gathered from 405 ninth graders, the present study examines the relation of book characteristics with situational and habitual reading motivation in and outside of school. The books which students indicated to have read were characterized by objective text complexity and text type. Results showed that first, recreational reading motivation exceeded school reading motivation. Second, that the reading of classic literature was a negative predictor of situational reading motivation. Third, in the school context, students who read more difficult books were less motivated to read the book. And fourth, longitudinal analyses showed that individual book reading experiences were linked to habitual reading motivation. The results and its practical implications for book reading in and outside of literature class will be discussed against the background of the negative trend of reading motivation development with age.

Do instructions to make a drawing and strategic knowledge affect drawing use and math performance?

Keywords: Mathematics, Problem solving, Secondary education, Teaching/instruction

Presenting Author:Johanna Rellensmann, University of Münster, Germany; **Co-Author:**Stanislaw Schukajlow, University of Münster, Germany; **Co-Author:**Claudia Leopold, University of Fribourg, Switzerland

In the present study, we investigated how instructing students to make a drawing, strategic knowledge about drawing, and the number of drawings generated are related to students' word problem solving performance in the domain of mathematics. Participants were 126 students in grades 9 and 10. First, students' strategic knowledge about drawing was assessed. Second, two weeks later, students were randomly assigned to one of two conditions (word problem solving *with* instructions to make a drawing for each word problem or word problem solving *without* instructions to make a drawing). We assessed how many drawings students created and how well they performed on a word problem test. Path analyses showed that strategic knowledge about drawing was a direct predictor of the number of drawings generated. Moreover, instructions to make a drawing had an indirect effect on word problem solving performance, which was mediated by the number of drawings generated. Our results confirmed the theoretically proposed relations between the instructions to make a drawing, strategic knowledge, actual strategy use, and math performance in word problem solving. In sum, our findings indicate that students' strategic knowledge about drawing and instructing students to make drawings not only increase students' use of drawings in mathematics but also affect math performance.

Reading attitude and text difficulty affect gains from 1:1 reading instruction in primary school

Keywords: Learning disabilities, Primary education, Reading comprehension, Teaching/instruction

Presenting Author:Suzanne Mol, Leiden University, Netherlands; **Co-Author:**Christine Espin, Leiden University, United States

(Study 3) This experimental study examined whether the reading attitude of 9-to-11-year-old students with reading difficulties would help explain the effects of two 1:1 instructional approaches in reading that can be implemented in a school setting, yet varied in intensity. In the first approach, students read a text three times and only received corrective feedback. Second, the more intensive approach comprised training in reading fluency and comprehension. Pre-service teachers provided both instructional approaches to students in a one-hour session at school, and two narrative text passages (i.e., easy, difficult) were practiced in counterbalanced order. Results showed that students gained most from the intensive approach when reading the difficult text. For the easy text, the significant interaction effect between reading attitude and instructional approach revealed that the intensive approach was most beneficial for students with negative attitudes, whereas the brief re-reading approach specifically improved the reading skills of students with positive attitudes. Findings imply that is important to take into account the reading attitude of primary school students with reading difficulties as well as text difficulty level in order to support students' fluent and accurate reading and comprehension of (practiced) texts.

Continuous professional development on reading for newly qualified teachers: A mixed-method approach

Keywords: Motivation, Reading comprehension, Teacher professional development, Teaching/instruction

Presenting Author:Iris Vansteelandt, AP University College/Ghent University, Belgium; **Co-Author:**Suzanne Mol, Leiden University, Netherlands; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

(Study 4) Several studies already indicated that continuous professional development (CPD) of teachers is crucial for quality education and the society. Teachers indeed play a key role in the learning of their students and this not only when it comes to their academic success, but also regarding their role in view of active participation in our 21st century society. Since the first years of teaching are determining teachers' future career path, the present study focuses particularly on beginning teachers and their professionalization at the transition from teacher education to the workplace. More specifically, the focus is on professionalizing beginning teachers in their role as reading role models for their students, as reading is a key skill for success in education and participation in the society. The aim of the present study is innovative as it compares the differential impact of a year-long individual versus group CPD program on newly qualified primary school teachers' reading motivation, reading behavior, and self-efficacy regarding teaching reading. The presentation will focus on the implementation and the results of the evaluation (i.e., by means of a mixed-method methodology) of the CPD program.

Session F 5

13 August 2019 12:00 - 13:30

Seminar Room - S05

Single Paper

Instructional Design

Instructional Design

Keywords: Achievement, Case studies, History, Instructional design, Learning approaches, Motivation, Quasi-experimental research, Secondary education, Student learning, Teaching/instruction

Interest group: SIG 06 - Instructional Design

Chairperson: Hanna Jarvenoja, University of Oulu, Finland

Performing the past? Benefits and challenges of a drama task in history education.

Keywords: Case studies, History, Secondary education, Teaching/instruction

Presenting Author: Tessa de Leur, University of Amsterdam, Netherlands; **Co-Author:** Carla Van Boxtel, University of Amsterdam, Netherlands; **Co-Author:** Tim Huijgen, University of Groningen, Netherlands

Imagining how it was like to live in the past may help students to understand historical developments and situations. In secondary history education, imagination activities mostly are limited to writing tasks. In this case study, the opportunities of a drama task are explored. Students in small groups examined historical sources and produced a short film clip as an answer to a historical question. Adopting a mixed-method approach, data included observations, interviews, a questionnaire, learner reports, a retention test, group journals and the assessment of the produced clip. Results indicated that both the students and their teacher perceived the drama task as motivating. The group discussions were rich in on-task utterances and the students reported that they thought the exercise of imagining the past was valuable for learning history and gaining insight in thoughts and feelings of people from the past. However, the clips were relatively poor in information.

Drawing Boundaries: Effects of Learner-Generated and Instructor-Provided Illustrations

Keywords: Achievement, Instructional design, Student learning, Teaching/instruction

Presenting Author: Logan Fiorella, University of Georgia, United States; **Co-Author:** Qian Zhang, University of Georgia, United States

In two experiments, college students learned from a scientific text about the human circulatory system by generating their own drawings and/or studying provided illustrations. In Experiment 1 (N=132), students studied a provided illustration, generated their own drawings, studied a provided illustration and then generated their own drawing, or generated a drawing and then studied a provided illustration. Results indicated no significant differences across groups on subsequent recall and transfer test, though drawing quality positively correlated with both performance on both tests. In Experiment 2 (N=141), some students were provided with additional support to help them process the provided illustration (i.e., labeling the illustration using a list of provided labels) or construct a quality drawing (i.e., drawing using a background and list of provided labels). The support enhanced recall but not transfer performance. Drawing quality and labeling accuracy were both positively correlated with performance on both tests. These findings suggest that studying provided illustrations can be at least as effective as generating drawings, and that stronger levels of support may be necessary for the benefits of drawing to exceed only studying provided illustrations.

Extending Productive Failure to a Non-STEM Domain: Testing the Effect on Learning Social Sciences

Keywords: Instructional design, Learning approaches, Quasi-experimental research, Student learning

Presenting Author: Valentina Nachtigall, Ruhr University Bochum, Germany; **Co-Author:** Nikol Rummel, Ruhr University Bochum, Germany; **Co-Author:** Katja Serova, Ruhr University Bochum, Institute of Educational Research, Germany

The current study builds on a large body of research demonstrating the effectiveness of Productive Failure (PF) for learning *in STEM domains*. In contrast, so far, it has not been investigated whether PF is also beneficial for learning *in non-STEM domains*. Therefore, we investigated the effect of PF on learning scientific practices in an out-of-school lab (OSL) for social sciences. OSLs are learning settings that aim at fostering students' knowledge about scientific practices by engaging them in authentic learning activities that simulate features of scientific inquiry. PF can be characterized as authentic learning activity that reflects the scientific practice of exploring solutions to a complex problem without knowing whether one's assumptions are correct or not. Therefore, PF seems particularly promising for learning research practices in an OSL. Building upon this characterization of PF as authentic learning activity and in light of the need of testing PF in non-STEM domains, this study extends one of our previous studies and investigates the effectiveness of PF for learning scientific practices in an OSL for *social sciences*. We conducted a quasi-experimental study with 152 10th graders and, following the paradigm of typical PF studies, we implemented two conditions: PF with problem solving prior to instruction, and Direct Instruction (DI) with instruction followed by problem solving. Contrary to our hypothesis, our findings show that PF and DI students' performance did not differ on a knowledge test. The results are discussed in light of findings from previous PF studies.

Generating a Teaching Video at Home: More Effective and Enjoyable than Restudying or Summarizing?

Keywords: Instructional design, Motivation, Student learning, Teaching/instruction

Presenting Author: Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Joran Visee, Utrecht University, Netherlands; **Co-Author:** Andreas Lachner, University of Tübingen, Germany; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Research has shown that after reading a text, teaching its content to a fictitious peer student on camera fostered learning outcomes for (young) adults compared to restudying that text. It is unclear what mechanism drives this *teaching on video* effect and whether teaching on video would also be an effective strategy in applied settings, for young students, and when compared to stronger control conditions than restudy. Therefore, the present experiment investigated the effectiveness of generating a teaching video as an instructional strategy during homework for primary school students in comparison to restudying or summarizing. On a Friday, primary school students (N=133) were provided with a text about photosynthesis and a homework assignment for over the weekend. This homework assignment instructed the Restudy Condition to read the text as often as necessary. The two other conditions were also instructed to read the text as often as necessary, followed by generating a summary (Summary Condition) or a teaching video (Video Condition) about the content of the text. The following Monday, students completed a conceptual knowledge posttest and a questionnaire. Results showed that only teaching on video but not summarizing improved test performance compared to restudying. Teaching on video was also a more enjoyable way of learning than restudying or summarizing and learning enjoyment mediated the effect of condition on test performance. These findings show that generating a teaching video can be an effective instructional strategy for primary school students who generate the video as part of a homework assignment.

Session F 6

13 August 2019 12:00 - 13:30

Seminar Room - S15

Single Paper

Teaching and Teacher Education

Pre-Service Teacher Education, Teaching and Teacher Education

Keywords: Language (Foreign and second), Pre-service teacher education, Quantitative methods, Quasi-experimental research, Reading comprehension, Survey Research, Teacher Effectiveness, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Julie Moote, University College London, United Kingdom

Occupational embeddedness of early career teachers – the importance of role stress and support

Keywords: Pre-service teacher education, Survey Research, Teacher Effectiveness, Teacher professional development

Presenting Author:Anita Sandmeier, The Schwyz University of Teacher Education, Switzerland; **Co-Author:**Julia Mühhausen, Work and Organizational Psychology, University of Bern, Switzerland; **Co-Author:**Martin Gubler, Lucerne University of Applied Sciences and Arts, Switzerland

Against the background of general teacher attrition, increasing numbers of student enrolments and retirements of older teachers at the same time, the challenge of retaining teachers for the long-term is more than ever of great importance. This empirical contribution follows a shift in research away from emphasizing reasons for turnover towards the question what actually keeps people in their jobs. The concept of *embeddedness* by Mitchell et al. (2001) acknowledges the basic premise, that reasons to stay are different from reasons to leave (Hom et al., 2012). Research on teacher turnover reveals high turnover rates at the early career stage (Borman & Dowling, 2008). Investigating antecedents and detrimental effects on occupational embeddedness of novice teachers is a first step to develop and implement actions at various levels (e.g., individual career counselling, teacher education, school administration). Within the complexity of influences on the teaching profession, this study focuses on the impacts of role stressors (role overload, role ambiguity and role conflict) and different forms of organizational support (supervisor and co-worker support) on occupational embeddedness. Analysis with SEM, based on data from early career teachers of 63 Swiss schools provide insights into the interplay of factors that keep teachers in their occupation. Our results highlight the importance of providing a supportive environment for young teachers as well as to clarify the accountability and the expectations linked to the teacher role.

What are the perspectives of expert educators on core practices in foreign language education?

Keywords: Language (Foreign and second), Pre-service teacher education, Teacher Effectiveness, Teacher professional development

Presenting Author:Malba Barahona, Pontificia Universidad Católica de Valparaíso, Chile

This presentation reports on the findings from a Delphi panel survey of a group of expert Chilean English language educators—teachers, teacher educators, and educational researchers—focused on building consensus around a set of core teaching practices for teaching English. The results shed light on the relevance of three specific core practices for teaching English to be potentially integrated into teacher education programs (facilitating target language comprehensibility, Focusing on Cultural Products and Practices, Selecting, designing and implementing specific methods to periodically assess students' learning in and between classes) and specifically as a component of the methods course and practicum experiences. These outcomes can contribute to expanding the discussion of the design of practice-based approaches in teacher education and the highly situated nature of core practices in practice-orientated learning environments.

Disentangling Task Demands – Preparing Prospective EFL Teachers for Their Future Diagnostic Tasks

Keywords: Language (Foreign and second), Pre-service teacher education, Quasi-experimental research, Reading comprehension

Presenting Author:Judith Sebastiani, University of Koblenz - Landau, Germany; **Co-Author:**Ingmar Hosenfeld, University of Koblenz - Landau, Germany

To provide appropriate learning environments, teachers should be skilled diagnosticians. The ability to precisely disentangle task demands can enable teachers to make more accurate judgments about learners, strengthen their confidence in their judgments and provide them with more hints for pedagogical decisions tied to their diagnosis. The purpose of this study is to combine approaches from the domain of educational psychology with approaches from the domain of teaching English as a foreign language (EFL) to draw a precise picture of the diagnostic skills of pre-service teachers regarding foreign language reading tasks and to observe whether their skills can be improved through a training focusing on empirical evidence on text and task demands. The quasi-experimental study examines the impact of the training on judgment accuracy (ranking component, level component, differentiation component), classroom-oriented tasks and judgment confidence. Considering this complex picture, implications for teacher education will be given.

Testing measurement invariance of beginning and advanced student teachers' perceptions of coherence

Keywords: Pre-service teacher education, Quantitative methods, Survey Research, Teacher professional development

Presenting Author:Katharina Hellmann, University of Education Freiburg, Germany; **Co-Author:**Jan Henning-Kahmann, University of Education, Freiburg, Germany

Coherence is a fruitful guiding theme to enhancing teacher education through actively intertwining structures, contents and phases of the professionalization process, thus allowing for the acquisition of integrated and transferable knowledge and the development of professional competencies over time (e.g. Canrinus, et al., 2015). Yet, the creation of coherent learning opportunities won't support these processes, if teacher candidates don't perceive such coherence. Furthermore, the construction of coherence being conceptualized as an ongoing process (Hammerness, 2006) suggests that coherence might be difficult to perceive especially for beginning students, not seeing the presented connections as being meaningful. Therefore, building upon our previous work on a hierarchical composite model and a newly developed questionnaire on student teachers' perceptions of coherence, the research question of this study was whether the assumed theoretical model of coherence would fit the data equally well for student teachers in different stages of their studies. Applying a procedure to analyze measurement invariance of composite models (MICOM) when using partial least squares (PLS) path modeling, only partial measurement invariance was established by comparing beginning and advanced student teachers in our sample, indicating that pooling data from these two groups would not be appropriate for drawing conclusions on student teachers' perceptions of coherence. Furthermore, the overall test of model fit showed that our model only fits well for students with a further study progress. Implications for universities' teaching development and a more active presentation of coherent learning opportunities as from the very beginning of teacher education will be discussed.

Session F 7

13 August 2019 12:00 - 13:30

Seminar Room - S16

Single Paper

Teaching and Teacher Education

Teacher Professional Development

Keywords: Action research, Communities of learners, Conversation/ Discourse analysis, Educational technology, In-service teacher education, Lifelong learning, Mixed-method research, Quantitative methods, Teacher professional development, Technology, Vocational education

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Clara Schumacher, University of Mannheim, Germany

Three cycles of teaching to weld: Developing vocational teaching on a scientific basis

Keywords: Action research, Conversation/ Discourse analysis, Teacher professional development, Vocational education

Presenting Author:Nina Kilbrink, Karlstad University, Sweden; **Presenting Author:**Stig-Börje Asplund, Karlstad University, Sweden

This paper concerns an action oriented study conducted between a welding teacher and two researchers in three iterative cycles. The teaching as well as the research is planned, conducted and analysed based on two theoretical frameworks; the variation theory (VT) and conversation analysis (CA), aiming to examine the relation between teaching and learning in vocational education, with a specific focus on learning to weld in a collaborative study between a vocational teacher and two researchers. The results can contribute to teachers' professional learning and an improvement of planning and conducting teaching in relation to specific objects of learning in vocational education. This research contributes to both theoretical and educational findings. Furthermore, combining VT and CA approaches in an action oriented study contributes developing concepts for an integrated analysis of both the content and the process of learning.

Disciplinary and Multidisciplinary Teacher Learning Communities: Equal Opportunities to Learn?

Keywords: Communities of learners, In-service teacher education, Mixed-method research, Teacher professional development

Presenting Author: Adi Mendler, Ben-Gurion University of the Negev, Israel; **Co-Author:** Aliza Segal, Ben Gurion University of the Negev, Israel

Teachers in professional learning communities can benefit from both common ground among participants, facilitating dialogue, and difference, which enables new knowledge to be shared. In disciplinary communities, common ground is provided by the discipline taught by all participants, whereas difference is provided by personal and professional variation (such as different classrooms, different pedagogical approaches). In interdisciplinary communities, difference stems largely from the different disciplines taught, whereas common ground stems from shared pedagogical practices. The current study examines what enables professional learning in teachers' interdisciplinary versus disciplinary communities. Recorded meetings (N=18) of communities of both types were coded, and a meeting of each type was selected for microanalysis. We examine the extent to which teachers communicated different kinds of knowledge (content knowledge, pedagogical knowledge, pedagogical content knowledge); the extent to which they engaged in discourse moves associated with knowledge building; and which factors promoted or hindered their learning. Findings demonstrate that although discourse moves associated with knowledge building were equally common in both types of communities, teachers in interdisciplinary communities tended to share primarily pedagogical knowledge and little pedagogical content knowledge. The nearly exclusive focus on a single category of knowledge limited learning opportunities in interdisciplinary communities. We attribute teacher reluctance to share discipline-related knowledge to assumed lack of relevance, fear of misinterpretation, and framing of community goals in ways that acknowledged only the teachers' interdisciplinary common ground and failed to take advantage of their disciplinary differences.

Hungarian Science and Mathematics Teachers' Professional Developmental Needs

Keywords: In-service teacher education, Lifelong learning, Mixed-method research, Teacher professional development

Presenting Author: Gábor Z. Orosz, University of Szeged, Hungary; **Co-Author:** Davaajav Purevjav, University of Szeged, Hungary; **Co-Author:** Edit Katalin Molnár, University of Szeged, Hungary

In an increasingly changing technology-based society with differing learner needs, teachers must continue improving their professional development. Moreover, science subjects were found to be the least popular in Hungary, especially physics and chemistry (Csapó, 2000), suggesting a demand for excellent teachers. This study examines how Hungarian science and mathematics (SM) teachers perceive their professional developmental needs. An online questionnaire was administered to 112 Hungarian SM teachers in 2018. They rated 18 components of teacher knowledge on a five-point Likert scale from four perspectives (P1-P4) and answered an open-ended question as well. In the case of present level of teachers' own knowledge (P1), means were very close to the four-point scale level. According to teachers' views the most important knowledge component was motivation in everyday practice (P2), professional development needs (P3), and inclusion in formal IST (P4). Women seemed to have higher level of need for P4 and they also reported higher importance regarding P2 (p

Using PIAAC data to explore the problem-solving skills of adults working in the educational sector

Keywords: Educational technology, Quantitative methods, Teacher professional development, Technology

Presenting Author: Bram De Wever, Ghent University, Belgium; **Presenting Author:** Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:** Kari Nissinen, University of Jyväskylä, Finland; **Co-Author:** Joonas Mannonen, University of Jyväskylä, Finland

The ever-evolving technological landscape is challenging educational workers' problem-solving skills in a technology-rich environment (TRE). In today's digital world, the competencies to be mastered include problem-solving skills in TRE, and education is important in equipping people with these skills. This study focusses on the problem-solving skills of adults working in the educational sector. Based on PIAAC (Programme for the International Assessment of Adult Competencies) data of the OECD, we investigate (1) the level of problem-solving skills of educational workers and (2) how these skills are associated with background factors. Crucially, we found out that adults working in education possessed weak skills more often than people working in other industry sectors. We present the models that predict problem-solving performance on the basis of theoretical assumptions as well as empirical support. Specifically, educational workers strong or weak performance seems to be associated with socio-demographic factors, as well as work-related and everyday-life factors. Educational significance of the work and implications for policy and practice are discussed. The models may be helpful when developing workplace learning practices and new approaches to foster educational workers' problem-solving skills to meet the needs of technological advancement at work.

Session F 8

13 August 2019 12:00 - 13:30

Lecture Hall - H07

Single Paper

Higher Education

Higher Education

Keywords: Assessment methods and tools, Case studies, Collaborative Learning, Communities of learners, Computer-supported collaborative learning, Conversation/ Discourse analysis, Educational technology, Higher education, In-service teacher education, Qualitative methods, Survey Research, Teaching approaches

Interest group: SIG 04 - Higher Education

Chairperson: Paul Swan, Monash University, Australia

Understanding students' acceptance of educational technology reform: a longitudinal study.

Keywords: Computer-supported collaborative learning, Educational technology, Higher education, Survey Research

Presenting Author: Ine Windey, KU Leuven, Belgium; **Co-Author:** Annelies Raes, KU Leuven, Belgium; **Co-Author:** Fien Depaep, KU Leuven, Belgium

The Technology Acceptance Model (TAM) is regularly used to investigate students' acceptance of new technologies and the impact on students' intention to use specific technologies. Most studies reveal that technology acceptance significantly influences actual use, but past studies have barely investigated technology acceptance from a longitudinal perspective which meets the question to what extent actual use influences technology acceptance. This study aims to close this research gap and presents both students' expectations and experiences towards educational technology. This study is situated within the context of a two-year campus-wide living lab project to increase the interaction and collaboration within university education. More specifically, this study zooms in on the use of technology-enhanced interactive quizzes during lectures and screen sharing technology during collaborative learning sessions. Based on the TAM, perceived usefulness, ease of use and behavioural intention were the variables included in the survey instrument for longitudinally examining students' expectations towards and experiences with the technology. Results reveal that students started out with a positive predisposition to the usefulness, ease of use, and behavioural intention of using educational technology in university settings. These expectations were more than satisfied after experiencing the technology as the TAM results after experience were significantly higher than before. This was the case for both technologies. The longitudinal results even counter the novelty effect. Qualitative results confirm these positive findings and stress that universities should embrace technology as it gives opportunities for improving interaction and collaboration during learning and instruction.

Criteria based assessment of teaching qualifications: Issues of validity

Keywords: Assessment methods and tools, Higher education, Qualitative methods, Teaching approaches

Presenting Author: Camilla Østerberg Rump, University of Copenhagen, Denmark; **Co-Author:** Sofie Kobayashi, University of Copenhagen, Denmark

The focus on teaching qualifications have increased in higher education, and teaching portfolios increasingly form basis for assessing teaching qualifications. However, little is known of how these portfolios are assessed. An interview study with assessors (Authors, 2017) indicated that experience was assessed in a norm based way, and that competence was rarely assessed, raising issues with both reliability (norm based assessment) and validity (competence not assessed). The focus of this study is issues of validity, i. e. assessment of competence. Recently, a new, more detailed standard for assessing teaching portfolios was introduced at our research-intensive university. To confirm the issues of reliability and validity, we collected 13 examples of assessment of teaching qualification from before the new standard. To see if the new detailed standard could reduce the issues of reliability and validity, we compared with 19

assessments from a workshop on assessment of teaching qualifications using the new standard. Results show that assessment of competence was scarce (3 of 13) before the new standard, thus confirming the validity issues in the interview study, but comprehensive (18 of 19) after the workshop using the new standard. Since the 30 participants in the workshops only constitute a small fraction of the approximately 1000 associate and professors who are potential assessors of applicants, we will not claim that the new standard *solves* the issue of validity (competence assessed), but we will claim that the new standard *can help* solve the issue by providing more specific sub-criteria to help identify specific competences.

Shared challenges and solutions in digital pedagogy – a case of joint workshop of two teacher groups

Keywords: Case studies, Educational technology, Higher education, In-service teacher education

Presenting Author:Marjaana Veermans, University of Turku, Finland; **Co-Author:**Essi Ryymin, Häme University of Applied Sciences, Finland; **Co-Author:**Anne-Maria Korhonen, Hamk University of Applied Sciences, Finland; **Co-Author:**Jenni Airola, University of Turku, Finland; **Co-Author:**Jiri Lallimo, University of Turku, Finland; **Co-Author:**Jukka Niinimäki, Häme University of Applied Sciences, Finland

This paper introduces a workshop that was shared between two teachers' digital pedagogy specialization programs, organized by a university and a university of applied sciences. The aim was that the teachers from different educational levels would jointly reflect strengths and challenges that they have met in their work during the digitalization of educational field. The aim was also to develop together solutions for the challenges that were identified during the workshop. The participants of the workshop were 30 teachers representing different educational levels, from basic education to higher vocational education. During the workshop the teachers participated in learning café –type of activities in six small groups. All the activities were audiotaped, transcribed, and analyzed by content analysis. The coding scheme had three main categories, all related to digital pedagogical development: challenges, strengths, and solutions. After this initial coding, the data were analyzed in a data-driven way by analyzing each main category further. Three categories were found: 1) Digital tools and materials 2) Digital skills and development, and 3) Digital pedagogical leadership. The most common challenges the teachers identified were especially related to development of teachers' skills and to systematic leading change in digital pedagogy. Our research showed that challenges related to digital pedagogical development are common among different educational levels, and reflection of them collaboratively can produce good solutions for them. Therefore, it may be beneficial to organize specializations programs and other type of in-service training programs jointly for different educational levels.

Socio-Cognitive Openness in Online Knowledge Building: Does Openness keep Conversations Going?

Keywords: Collaborative Learning, Communities of learners, Computer-supported collaborative learning, Conversation/ Discourse analysis

Presenting Author:Hennie van Heijst, Aeres University of Applied Sciences, Netherlands; **Co-Author:**Frank De Jong, Aeres University of Applied Sciences & Open University Heerlen, Netherlands; **Co-Author:**Jan van Aalst, University of Hong Kong, Hong Kong; **Co-Author:**Natascha de Hoog, Open University the Netherlands, Netherlands; **Co-Author:**Paul A. Kirschner, Open University of the Netherlands, Netherlands

This study analyses socio-cognitive dynamics in online knowledge building discourse in a blended master course using a socio-cognitive openness framework. Socio-cognitive openness is the degree to which contributions to discourse show a willingness to think and build knowledge together in the community. The framework consists of four social and four cognitive indicators of openness and was applied to 594 contributions selected from two communities working in the asynchronous knowledge building tool Knowledge Forum®. Results show a moderate degree of openness in general, more social than cognitive openness, a large variety in frequencies of the indicators used, and teachers' contributions expressing more social openness as compared to students. The assumption that socio-cognitive openness is positively related to the degree of follow up contributions was corroborated for the cognitive indicators of openness. Social openness however did not lead to more follow up, and for one indicator turned out to be slightly counterproductive.

Session F 9

13 August 2019 12:00 - 13:30

Seminar Room - S07

Single Paper

Higher Education, Learning and Instructional Technology, Teaching and Teacher Education

Inquiry Learning

Keywords: Cognitive development, Cognitive skills, Collaborative Learning, Computer-assisted learning, Cooperative/collaborative learning, Higher education, Inquiry learning, Instructional design, Metacognition, Mixed-method research, Model-based reasoning, Reasoning, Teacher professional development

Interest group: SIG 20 - Inquiry Learning

Chairperson: Jenefer Husman, University of Oregon, United States

The role of two types of scaffolds in technology-enhanced collaborative inquiry-based learning

Keywords: Collaborative Learning, Computer-assisted learning, Higher education, Inquiry learning

Presenting Author:Joni Lämsä, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland; **Co-Author:**Pekka Koskinen, University of Jyväskylä, Finland; **Co-Author:**Jouni Viiri, University of Jyväskylä, Finland; **Co-Author:**Joonas Mannonen, University of Jyväskylä, Finland

In this presentation, we focus on the differences between technology-enhanced collaborative inquiry-based learning (CIBL) processes when an inquiry problem is enhanced with two types of scaffolds. The first scaffold gave support for technology-enhanced inquiry-based learning (IBL) while the second one supported technology-enhanced CIBL. The differences between the non-scaffolded groups (N = 14) and scaffolded groups (N = 17 and 15 in scaffold 1 and 2 conditions, respectively) were studied in undergraduate physics courses (N = 231). First, we analysed timestamps and the groups' inputs to the problem based on log-data. The discussions of eleven groups were screen captured and audio recorded to conduct lag sequential analysis (Bakeman & Gottman, 1998) based on the IBL phases (Pedaste et al., 2015). We found that the duration of the groups' learning processes varied depending on the condition ($F(2, 45) = .166, p = 0.045$). We also found a slight indication that the scaffolds enhanced the groups' learning processes as the relative number of correct answers was higher in the scaffolded conditions. However, the difference was not statistically significant. Regarding the sequential patterns of the learning processes, there was a common transition for all the conditions (from the conclusion to the discussion phase). In the scaffolded conditions, significant transitions were associated to the conceptualisation phase: the transitions from the conceptualisation to the conceptualisation phase and from the conceptualisation to the investigation phase were significant in scaffold 1 and 2 conditions, respectively. We will also discuss how the analysis of sequential patterns contributes to efficient scaffolding as well as reflect what the implications of log-data analysis are for future development.

Metacognitive prompts facilitate teachers' reflections on dynamic open inquiry

Keywords: Inquiry learning, Metacognition, Mixed-method research, Teacher professional development

Presenting Author:Michal Zion, Bar-Ilan University, Israel; **Co-Author:**Esther Rimerman, Bar Ilan University, Israel; **Co-Author:**Idit Adler, Bar-Ilan University, Israel

Internalizing the core characteristics of dynamic open inquiry is essential for teachers to effectively support their students' inquiries: *Changes occurring during inquiry, learning as a process, procedural understanding, and affective points of view*. Therefore, the goal of this study was to examine teachers' expressions of the characteristics of dynamic open inquiry, following metacognitive prompting (Planning, Process management, Monitoring, Debugging, or Evaluation). Using mix method research, we quantified expressions of dynamic inquiry characteristics in teachers' reflections. The results indicate that not all the criteria of dynamic inquiry are equally prevalent in teachers' reflections. These expressions varied according to the metacognitive prompt the teachers received. The results have implications for teachers' professional development, specifically for the design of metacognitive prompts to support teachers in performing inquiry.

The Emergence of Source Evaluation Criteria: A Microgenetic Study

Keywords: Cognitive development, Cognitive skills, Inquiry learning, Reasoning

Presenting Author:Clark Chinn, Rutgers University, United States; **Co-Author:**Sarit Barzilai, University of Haifa, Israel

Prior research has typically examined learners' sourcing skills either at a single time-point or at points before and after sourcing interventions. However, such

designs can neither uncover moment-to-moment processes of change nor explicate how growth occurs in the absence of specific instruction. To address these gaps we conducted a microgenetic study of the growth of learners' sourcing competence. Specifically, we examined how students' source evaluation criteria change after extended engagement with diverse sources and how source evaluation criteria emerged over time. Twenty 9th graders met once a week for 13 weeks and performed science and social science inquiry tasks using multiple, diverse documents. Participants also responded to a pre- and posttests and were individually interviewed every two weeks. Results showed that, following the study, students mentioned more criteria, and increased specifically in mentioning benevolence of sources, the currency of sources, and publication venue expertise. This indicates that repeated exposure to diverse documents, along with source evaluation prompts, enables growth in sourcing criteria even without explicit instruction. New criteria usually appeared in response to source evaluation prompts and spontaneous; unprompted use took longer to occur and exhibited a less stable pattern. Thus, despite growing awareness, participants experienced ongoing difficulties applying source evaluation criteria. The findings also demonstrated that some criteria (e.g., expertise) are learned before others and are more consistently adapted. These findings can inform the development of interventions to improve sourcing. They may also inform the development of a learning progression for systematically introducing students to sourcing criteria.

Understanding Climate Change Through Constructive and Example-Based Scaffolds

Keywords: Cooperative/collaborative learning, Inquiry learning, Instructional design, Model-based reasoning

Presenting Author: Sarah Bichler, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Sonya Richards, No academic affiliation, Germany; **Co-Author:** Lisa Hasenbein, Eberhard Karls Universität Tübingen, Germany; **Co-Author:** Marcia Linn, University of California-Berkeley, United States; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

This study investigates effects of constructive and example-based scaffolds on integrated understanding in an inquiry unit on global climate change with dynamic models. Seventy-one university students (target N is 200) either studied in pairs or alone and with constructive or example-based scaffolds. The constructive scaffold required learners to create a visual diagram and provided them with automated knowledge integration guidance. The example-based scaffold was a modeling video in which a peer learner demonstrated the diagram activity. We measured integrated understanding of climate change with 10 single-choice items (reliability of pre- $r_{tt} = .28$ and posttest $r_{tt} = .60$). Results of a 2-factorial ANOVA supported our hypothesis that collaborative learners have more integrated knowledge with the constructive than with the example-based scaffold, but that individual learners have more integrated knowledge with the example-based than with the constructive scaffold. Our conclusion from this preliminary data is that collaborative learners build on each other's ideas with the constructive scaffold and gain integrated understanding because of their interactive engagement. With an example-based scaffold, collaborative learners do not engage interactively because the scaffold gives them less reason to interact. In contrast, individual learners do not fully profit from the constructive scaffold because they have reason but no partner to interact with and the potential of the constructive scaffold to go beyond what is provided by the materials is not utilized. Instead, important or inaccurate ideas stay undetected. Individual learners better integrate their ideas when accurate ideas are directly presented to them through the example-based scaffold.

Session F 10

13 August 2019 12:00 - 13:30

Lecture Hall - H09

Single Paper

Higher Education

Higher Education

Keywords: Attitudes and beliefs, Case studies, Educational Psychology, Higher education, Learning approaches, Multicultural education, Quantitative methods, Self-regulation, Student learning

Interest group: SIG 04 - Higher Education

Chairperson: Alessia Eletta Coppi, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland

The Impact of Writing and Answering Questions on Study Success

Keywords: Higher education, Learning approaches, Self-regulation, Student learning

Presenting Author: Natalie Enders, Universität Hildesheim, Germany; **Co-Author:** Sandra Rothenbusch, Institute of Psychology, Technische Universität Braunschweig, Germany

Learning strategies are crucial for self-regulated learning and academic success (Weinstein, Acee, & Jung, 2011). Instructing students to answer and generate questions are considered promising approaches to support students' preparation for final examinations in lectures (King, 1992). Whereas question-answering is mainly based on recognition, self-questioning should foster the elaboration of the subject matter (Craik & Lockhart, 1972). This study focused on the effects of both questioning activities on students' learning performance, use of learning strategies, and learning motivation. Furthermore, the impact of the quality of the generated questions on the aforementioned variables were analyzed. An intervention comprising two thematic blocks was integrated into two parallel lectures on general psychology for bachelor students. In the first block, half the students were instructed to write three single-choice-questions, whereas the other half were supposed to answer three single-choice-questions. Tasks were switched in the second block. $N=197$ students consented to participate in the study. Controlling for prior knowledge, students who executed both activities achieved significantly more final exam points than students who executed no activity. However, no difference between the kinds of questioning activity was found. The self-reported use of elaboration and organizational strategies increased significantly over the intervention, but not in dependence on the kind of questioning activity. The intervention had no effect on students' learning motivation. The influence of the question quality on the dependent variables is currently being considered. In the presentation, theoretical and practical implications for the application of questioning as a learning strategy will be discussed.

Identifying University Students' Study Profiles

Keywords: Higher education, Learning approaches, Quantitative methods, Student learning

Presenting Author: Jukka Utriainen, University of Jyväskylä, Finland; **Co-Author:** Päivi Tynjälä, University of Jyväskylä, Finland; **Co-Author:** Eeva Kallio, University of Jyväskylä, Finland; **Co-Author:** Miika Marttunen, University of Jyväskylä, Finland; **Co-Author:** Asko Tolvanen, University of Jyväskylä, Finland

The importance of teaching-learning environments that nurture students' understanding and efficient learning approaches is widely emphasized in research literature. However, it is still unclear whether the students' perceptions of teaching-learning environment and their approaches to learning are consistently associated with each other. Hence, this study investigates university students' study profiles based on both their approaches to learning and perceptions of teaching-learning environment. The study also compares student profiles with students' critical thinking and study satisfaction. The data consist of 1 390 Finnish university students' responses to a modified version of Experiences of Teaching-Learning Questionnaire (ETLQ). The latent profile analysis resulted in five student study profiles. The students belonging to "Encouraged and deep learners" (20.8 % of the students) profile perceived teaching-learning environment very positively on average and achieved highest scores on critical thinking. In contrast, students having an "Unsatisfied and surface oriented" (9.8 % of the students) profile perceived teaching-learning environment well below average. Moreover, these students achieved low means in critical thinking and were also more likely to consider changing their major subject and interrupting their studies than students belonging to the other profiles. Efficient pedagogical means are needed to support students who feel unsatisfied with their learning environment and consider interruption of their studies.

University students in the classroom: How faculty contexts interact with student expectations

Keywords: Attitudes and beliefs, Case studies, Higher education, Multicultural education

Presenting Author: Samantha Marangell, University of Melbourne, Australia

This mixed-methods study investigated first-year university students' conceptualizations, expectations, and experiences of an internationalized university. The aim was first to understand how these student attitudes and ideas may or may not differ from faculty goals, and then to understand how these expectations

interacted with faculty contexts to either inhibit or encourage certain internationalization learning objectives. The study included a quantitative survey of students' attitudes, beliefs, and ratings of their classroom experiences and activities; qualitative one-on-one interviews to explore students' conceptualizations in more details; and interviews with heads of faculty to understand the learning context for students' experiences. Findings highlight that certain student variables interact in particular ways with the unique faculty context to often result in surprising consequences. They demonstrate that students' expectations and the faculty's learning context combine to affect both how the students interpret the classroom and how the students interpret each other. This research sheds light on ways universities can better tailor their learning goals and strategies to match the unique internationalization context of their faculty and of student population.

Targeting efficient studying in higher education – a student perspective

Keywords: Educational Psychology, Higher education, Learning approaches, Student learning

Presenting Author: Maria Öhrstedt, Stockholm University, Sweden; **Co-Author:** Max Scheja, Stockholm University, Sweden

Previous research indicates that university students' approaches to learning influence academic achievement and the quality of learning outcomes. Approaches to learning seem to develop through a process where student factors interact with factors in the learning context. Students' subjective perceptions of the learning environment seem to be crucial in this process, but there is a need to clarify which aspects steer students towards focusing on certain studying activities in particular learning contexts. This study aimed at elaborating the student perspective in the process of selecting studying activities. It did so by identifying similarities in aspects that students themselves, despite adopting different approaches to learning, considered to be important in studying. Students' approaches to learning were assessed in two successive psychology introductory courses (N=261), using the Approaches and Study Skills Inventory for Students (ASSIST). A selective student sample (N=11), representing students with different approaches to learning, described their studying activities in repeated interviews. The qualitative analysis of the interview transcripts revealed that the development of approaches to learning could be described as negotiation process where different aspects of learning are related to each other. In particular the students described a common set of reference points: 1) previous studying activities, 2) course recommendations, 3) learning outcomes, 4) assessment demands, and 5) time and effort spent on studying. Despite great variation in students' tendencies to adapt their approaches to learning, this targeting process resulted in a gradual homogenization of studying activities, and allowed students to feel they were studying efficiently.

Session F 11

13 August 2019 12:00 - 13:30

Lecture Hall - H05

Single Paper

Motivational, Social and Affective Processes

Teaching, Instruction and Achievement

Keywords: Achievement, Emotion and affect, Intelligence, Learning approaches, Motivation, Quantitative methods, Secondary education, Self-regulation, Student learning, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 17 - Methods in Learning Research

Chairperson: Corinne Wyss, Zurich University of Teacher Education, Switzerland

School Engagement in High Ability Students: Developmental Trajectory and Educational Outcomes

Keywords: Achievement, Intelligence, Motivation, Teaching/instruction

Presenting Author: Alicia Ramos, KU Leuven, Belgium; **Co-Author:** Bieke De Fraine, KU LEUVEN, Belgium; **Co-Author:** Karine Verschueren, KU Leuven, Belgium

School engagement has received increasing attention because of its importance to student outcomes and its malleability. For high-ability students, a lack of school engagement has been theoretically and empirically linked to underachievement. However, longitudinal research examining the evolution of their engagement over time, its co-evolution with achievement, and its effect on longer-term educational outcomes is lacking. In this study, we examined the development of school engagement in high-ability versus average-ability students across late elementary and early secondary school. Among the highly able students we also investigated engagement's co-development with achievement and the effect of differentiated instruction on engagement and achievement development. Finally, we examined the predictive value of engagement and achievement trajectories for secondary school retention and non-academic studies, considered underachievement outcomes. We found that, on average, high ability student had lower initial engagement than their peers, and their engagement remained lower across the transition to secondary school. For the high ability students, the intercept and trajectory of engagement were not associated with those of achievement. Differential instruction in grades 4-5 was associated with higher initial levels of both engagement and achievement in grade 5, but not with changes in these variables over time. The underachievement outcomes were predicted by the intercept of achievement but not by engagement's intercept or trajectory. This study contributes to the knowledge on the development of cognitively highly able students' engagement, on differentiated instruction as a contextual factor influencing their engagement, and on less-studied long-term educational outcomes of high ability students.

How do students with different learning characteristic profiles perceive teacher feedback?

Keywords: Motivation, Quantitative methods, Secondary education, Teaching/instruction

Presenting Author: Ariane S. Willems, University of Goettingen, Germany; **Co-Author:** Katharina Dreiling, University of Göttingen, Germany

Teacher feedback is one of the most influential factors for successful learning (Hattie & Timperley, 2007). Accordingly, research illustrates that the quality of feedback differentially predicts students' learning outcomes. However, little attention has been paid to how students' individual perception of feedback influences its effectiveness and, perhaps even more importantly, how the students' feedback perception itself is influenced by their individual initial cognitive and motivational learning characteristics. Based on empirical findings illustrating the impact of individual student characteristics on the effectiveness of learning processes (Seidel, 2006; Willems & Dreiling, 2018), we assume that students' learning characteristics also influence their perception of their learning environment – e.g. the feedback they receive. Based on these considerations, the purpose of our study is (i) to identify individual student profiles based on different motivational and achievement-related characteristics and (ii) to investigate the effects of these profiles on the students' perception of teacher feedback. From a methodological point of view, we consider that motivational and achievement-related characteristics interact within individuals and should therefore be modeled as multifaceted profiles by applying person-centered approaches. In a longitudinal study, we investigated n=810 senior high school students from German language classes. We developed a standardized questionnaire to assess different dimensions of teacher feedback and student achievement-related and motivational characteristics. By using Latent-Profile-Analyses, we identified five distinct student profiles with different combinations of achievement-related and motivational characteristics. In depth analyses showed that student profiles assessed at the beginning of the school semester influenced the perception of different dimensions of feedback measured 6 months later.

Achievement Emotions and School Transition - Individual and Contextual Determinants

Keywords: Achievement, Emotion and affect, Student learning, Teaching/instruction

Presenting Author: Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:** Simon Meyer, University of Erlangen-Nuremberg, Germany; **Co-Author:** Ramona Obermeier, Friedrich-Alexander Universität, Germany

While previous studies in the context of the transition from primary to secondary school have mainly addressed social, ethnic-cultural, and regional disparities, specific individual factors, such as achievement emotions at the beginning of secondary school, have been barely analysed. Therefore, in this empirical study, students at the beginning of secondary school responded in a questionnaire regarding their positive and negative achievement emotions (enjoyment, pride, anger and anxiety) in orientation to the control-value approach (Pekrun, 2006). The study was carried out six to eight weeks after students entered fifth grade of secondary schools. The sample included N = 397 students (59.4% female) with an average age of = 10.26 (SD = .49). The students were distributed among 9 schools under ecclesiastical sponsorship. With regard to the postulated individual and contextual predictors of achievement emotions at the beginning of secondary school, it was confirmed that different school factors, as well as individual determinants significantly contribute to the explained variation. While

intrinsic motivation ($\beta = .38$; $SE = .03$, p

Exploring connections of learning motives and learning strategies in self-regulated learning

Keywords: Achievement, Learning approaches, Motivation, Self-regulation

Presenting Author:Éva D. Molnár, University of Szeged, Hungary; **Co-Author:**Edit Tóth, MTA-SZTE Research Group on the Development of Competencies, Hungary

In the present study, we focus on the structure of self-regulated learning and its adaptive and maladaptive dimensions and their connections. The purpose of this study was to examine how motives influence the choosing of learning strategies and which of them is more adaptive in self-regulation of learning. Structural equation modeling (SEM) was applied to answer the research question. The study was carried out with a large sample assessment ($N=4082$) among Hungarian students (grade 4). Results suggest that, in general, the more developed mastery-approach and performance-approach goals and positive self-efficacy beliefs a student have, the more likely she or he is able to manage their learning activities with adaptive learning strategies.

Session F 12

13 August 2019 12:00 - 13:30

Lecture Hall - H10

Single Paper

Culture, Morality, Religion and Education, Teaching and Teacher Education

Pre-Service Teacher Education and Competencies

Keywords: Case studies, Comparative studies, Competencies, Content analysis, E-learning/ Online learning, Educational technology, Learning approaches, Literacy, Pre-service teacher education, Teacher professional development, Values education, Vocational education

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education

Chairperson: Lan Yang, The Education University of Hong Kong, Hong Kong

Using case-based e-learning scenarios to enhance PSTs' diagnostic and planning abilities

Keywords: Case studies, Competencies, E-learning/ Online learning, Pre-service teacher education

Presenting Author:Sarah Dannemann, Leibniz University Hannover, Germany; **Presenting Author:**Julian Heeg, Leibniz University of Hannover, Germany

Teachers' professional knowledge and abilities have been in the focus of educational research for over 30 years. In his influential approach, Shulman (1987) described pedagogical content knowledge as a crucial dimension. It includes knowledge about typical students' conceptions and learning activities that foster students' understanding. Students' individual conceptions are highly relevant for effective learning. Therefore, teachers should have diagnostic and planning abilities considering students' conceptions. However, science pre-service teachers (PSTs) show difficulties with these tasks. Many PSTs have, for example, a teacher- and content-centered perspective on teaching-learning processes (Larkin, 2012). Therefore, the PSTs need to reconstruct their perspective and consider students' different learning potentials and learning paths. As impulses for this reconstruction process, case-based e-learning scenarios for biology and chemistry teacher education were designed. Their central component is a video-vignette that shows the learning processes of only a few students in detail. The e-learning scenarios are formatively evaluated in case studies with 23 PSTs. Data is gathered by videotaping the PSTs in small groups and collecting their written artefacts. The verbalized data were analyzed with the qualitative content analysis and metaphor analysis. Interactions and nonverbal parameters were explored in a video analysis using theory-based deductive and inductive categories. The results show that the e-learning scenarios are a promising method: The PSTs reconstruct their perspectives on teaching-learning processes towards a student-centered view. They also were able to enhance their knowledge about typical students' conceptions. Some master graduate PSTs also improved their diagnostic and planning performances.

Improving student teachers' competence of lesson planning from a vocational education perspective

Keywords: Competencies, Content analysis, Pre-service teacher education, Vocational education

Presenting Author:Matthias Söll, University of Kassel, Germany

Learning how to plan lessons is an important element of student teachers' professional development, as lesson planning is a basic competence of professional teachers.

There is a range of theories and guidelines about the practice of lesson planning. They often emerge from the field of general didactics, although lesson planning is greatly influenced by subject didactics. Moreover, just a few studies focus this important competence.

Against this background, the research project to be presented is focused on an evidence-based approach to improve lesson planning competence of student teachers from a vocational education perspective.

The innovative idea of the concept at hand is an analogy between lesson planning and scriptwriting for anchored instruction films. It is hypothesized in the accompanied research project that students should plan more subject didactically based and elaborated. Moreover, it can be assumed that they also focus the learning processes of individuals and their interactions.

To examine these effects, pre-post vignette tests were applied in a parallel test research setting. Altogether 84 paired pre- and post-tests were collected in three seminars in the master's degree program business and economics education. The data was analyzed with methods of qualitative content analysis.

In general, the analysis of the vignette tests shows positive developments of the student teachers' competence of lesson planning, operationalized through the quantity of the addressed categories. However, the explanations of coherences between the categories are partially absent or little sophisticated. Against this background, the instructional design should be advanced and applied to further seminars.

Educating for democracy through intercultural virtual problem-based learning in teacher education.

Keywords: Competencies, Learning approaches, Teacher professional development, Values education

Presenting Author:Christoph Dähling, University of Bonn, Germany; **Co-Author:**Jutta Standop, Friedrich-Wilhelms-Universität Bonn, Germany; **Co-Author:**Alfred Weinberger, Pädagogische Hochschule der Diözese Linz, Austria

The pilot-study aims to examine an international virtual seminar based on problem-based learning (intercultural virtual PBL) in teacher education. The research question is which design characteristics of a PBL-setting can foster democratic learning experiences.

It is assumed that a problem-based learning setting based on interculturality can foster democratic learning experiences.

An intercultural group (Austrian/German) of pre-service teachers ($N = 29$) from a German and Austrian university was studied at four points of time during the treatment. The treatment was the intercultural virtual PBL using critical incidents which described typical intercultural problems teachers can encounter at work. Data collection methods were (1) The Criteria of Inquiry Learning Inventory (CILI, Reiting, 2016) which assesses specific democratic learning experiences (e.g. experience-based hypothetization, conclusio-based transfer) and (2) an open question (self-assessment) concerning participants' learning experiences (post-test only).

Descriptive findings of the CILI-data show a high overall score for democratic learning experience. However, the democratic learning experiences did not significantly increase during the intervention. The content analysis of the answers to the open question showed predominantly positive assessments of the CILI-dimensions, particularly the international cooperation and the topic intercultural learning was mentioned positively by the participants.

Problems with the PBL-design, implications for teacher education and the current study which is based on this pilot study are discussed.

How pre-service teachers define digital literacy – a cross-cultural study

Keywords: Comparative studies, Educational technology, Literacy, Pre-service teacher education

Presenting Author:Eva Brante, Malmö University, Sweden; **Co-Author:**Alexandra List, The Pennsylvania State University, United States; **Co-Author:**Holly K. Lee, Georg Mason University, United States

This study examined the conceptions of digital literacy of 309 pre-service teachers in two different cultural and educational settings, the United States and Sweden. The aim was two-folded: 1/ to find out how this group, central for citizens' education, conceptualize a key-competence in the 21st century and 2/to identify areas related to digital literacy that needs to be strengthened in teacher education programs. The pre-service teachers answered both open-ended questions and selected-response questions. In the open-ended question they were asked to define digital literacy. Based on their responses, we identified four profiles of digital literacy conceptions, progressing in sophistication (i.e., technology focused, digital reading focused, goal directed, reflecting critical use). In the selected-response answers, pre-service teachers in both settings were asked to identify those skills or competences that they considered to be essential for digital literacy, from a provided list. These selections were used in cluster analysis to further identify patterns in pre-service teachers' conceptions. Based on pre-service teachers' answers to open-ended and selected-response questions, we propose a framework for understanding different conceptions of digital literacy. We see pre-service teacher students' conceptions of digital literacy as falling along a continuum of sophistication, from (the majority of) students considering digital literacy to only be technology focused, to students considering digital literacy to require critically reflective technology use. The framework may be used to guide pre-service teacher instruction in digital literacy, both as a design and as a didactic tool to create lessons incorporating and assessing all four conceptions of digital literacy.

Session F 13

13 August 2019 12:00 - 13:30

Seminar Room - S09

Single Paper

Higher Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Assessment methods and tools, Competencies, Educational Psychology, Higher education, Mixed-method research, Pre-service teacher education, Reflection, Survey Research, Teacher Effectiveness, Teacher professional development

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness

Chairperson: Susan Jones, University of Exeter, United Kingdom

Burnout Risk in Teaching: The Role of Experience, Gender, Self-Efficacy and Mindfulness

Keywords: Educational Psychology, Pre-service teacher education, Survey Research, Teacher professional development

Presenting Author:Silke Schworm, University of Regensburg, Germany; **Co-Author:**Helen Jossberger, University of Regensburg, Germany

The aim of the present study was to investigate the role of experience, gender, self-efficacy, and mindfulness on burnout risk in the professional domain of teaching. Prior research revealed that teachers are endangered to become burned out. In order to prevent burnout, it is essential to understand what factors can reduce the perceived stress level and promote well-being. Self-efficacy and mindfulness have been found to be related to joy, fewer concerns, and reduced tension. Prior research has also indicated that females tend to report lower self-efficacy and higher emotional exhaustion than males. We conducted a survey study to examine whether self-efficacy and mindfulness can reduce the burnout risk. Moreover, we were interested to see how professional experience and gender influence the relationship. In total, 191 participants took part in our study. The sample consisted of 127 student teachers and 64 professional teachers. Burnout risk, self-efficacy and mindfulness were assessed with established self-report questionnaires. We performed regression analyses and MANOVA. The results reveal significant differences. Professional teachers show higher self-efficacy and more mindfulness than student teachers do. Moreover, we found that self-efficacy and mindfulness were strong predictors for personal fulfilment. Fostering self-efficacy and mindfulness during teacher training could be strategies to promote personal fulfilment in an early career stage. Experiencing personal fulfilment and being confident about one's own performance is expected to reduce the risk of developing burnout in professional practice.

Changes in educational science research competencies among teachers in further education

Keywords: Competencies, Higher education, Mixed-method research, Teacher professional development

Presenting Author:Wolfram Rollett, University of Education Freiburg, Germany; **Co-Author:**Daniel Kittel, University of Education Freiburg, Germany, Germany; **Co-Author:**Jana Groß Ophoff, Tübingen School of Education, Germany

Teachers are increasingly required to back up their teaching activities with scientific evidence (Weber & Achtenhagen, 2009), but seldom show a high level of Educational Research Literacy (ERL, Shank & Brown, 2007). Learning opportunities in further education seem to be a promising way to convey the required competencies to teachers, but there is no empirical evidence for this assumption. To address this void a postgraduate master's course in *Teaching and School Development* at the University of Education Freiburg, Germany, was evaluated for two years in a mixed-methods-design. The sample consists of 16 teachers and covered a full cohort of students. A standardized competence test (LeScEd, Groß Ophoff et al., 2017) was used in a pre-post-test design to assess changes in the ERL competence facets *Information Literacy*, *Statistical Literacy* and *Evidence-Based Reasoning*. Nine of the teachers were interviewed in course of their studies. The teachers' Information Literacy and Evidence-Based Reasoning improved significantly from a rather low to an intermediate proficiency level. For Statistical Literacy no significant development could be determined. Within the interviews the students confirmed that they had benefited in their research competencies, especially concerning their knowledge about research methods and statistics as well as their ability to work scientifically.

Theoretical foundations and teaching quality at universities: What do we measure? What do we know?

Keywords: Assessment methods and tools, Reflection, Teacher Effectiveness, Teacher professional development

Presenting Author:Ulrike Schwabe, DZHW - German Centre for Research on Higher Education and Science Studies, Germany; **Co-Author:**Axel Oberschelp, DZHW Hannover, Germany; **Co-Author:**Edith Braun, Justus-Liebig-Universität Giessen, Germany

Most recently, the German Science Council has addressed the issue of quality management and quality assurance in university teaching (Wissenschaftsrat 2017). Especially, the convergence of academic education and labour market, i.e. the more intensive entanglement of „vocational-practical and theoretical-reflexive competences“ (ebd. P. 11), is seen of paramount importance.

Focusing on learning outcomes can be interpreted as a paradigm shift: from knowledge transfer to competence acquisition. Instead of highlighting input (like students and available resources for teaching), learning outcomes (like reaching defined educational goals and learning gains) are addressed henceforth (Wissenschaftsrat 2017). This perspective directly goes along with special challenges for methods to assess performance in teaching in a valid manner. Since theory-based, standardized evaluation procedures are rarely established, teaching quality is not comparable across universities yet. Hence, this contribution aims to answer the following two central questions:

(a) How is performance in teaching at German universities recently measured? Which instruments on which levels are used? How does common practice look like?

(b) How is teaching quality measured and ensured in other countries? What are lessons learned from other institutional contexts?

To answer these two questions, we analytically distinguish between three levels (micro, meso and macro) as well as three dimensions (process, structure and outcomes) stressing different facets of quality.

Session F 14

13 August 2019 12:00 - 13:30

Seminar Room - S06

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Assessment and Evaluation

Keywords: Assessment methods and tools, At-risk students, Cognitive development, Content analysis, Developmental processes, Early childhood education, Educational technology, Higher education, In-service teacher education, Mixed-method research, Qualitative methods, Self-regulation, Teacher professional development, Teaching/instruction, Video analysis

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Katja Lenz, University of Education Freiburg , Germany

Implementation of an educational philosophy: A multiple-case study of an evaluation model

Keywords: Assessment methods and tools, At-risk students, In-service teacher education, Teacher professional development

Presenting Author: Shirley Miedjensky, University of Haifa, Israel; **Co-Author:** Irit Sasson, University of Haifa, Israel

Implementation in education refers to a process by which the ability exists to advance and to assimilate learning among all professionals in the educational community around a collective educational goal. This article presents an evaluation model for implementation process that was investigated in multiple case studies. The model includes three main components: building awareness of the educational philosophy, including recognizing its value and its relevance for the educator; creating deep understanding of the educational philosophy and all of its components; and optimally implementing the practices which correspond to the educational philosophy. Each of the elements of implementation must be expressed in implementation circles which expand through the organization – from the narrow managerial staff to the educational community members. From the implementation model, an evaluation program has been created to examine the effectiveness of the assimilation of the educational philosophy into the organization. The evaluation tools have been investigated in nine educational communities for youth at risk. The research tools included an attitude questionnaire filled out by 159 educators, an understanding-performance questionnaire filled out by 153 educators and interviews with 74 members of the educational staff. A cross-case analysis of the three components enables an in-depth and accurate investigation of the implementation process, identification of strengths and weaknesses and an appropriate design for the continuation of the required intervention process.

Confidence-based marking for SRL in Secondary Teacher Education: students' voice.

Keywords: Higher education, Mixed-method research, Self-regulation, Teaching/instruction

Presenting Author: Ana Remesal Ortiz, Universitat de Barcelona, Spain; **Co-Author:** Fátima Vega, Universitat de Barcelona, Spain; **Co-Author:** Gemma Pérez-Clemente, Universitat de Barcelona, Spain; **Co-Author:** Mireia Álvarez-Brinquis, Universitat de Barcelona, Spain

Confidence-based marking (CBM) is a well-known psychometric assessment strategy widely used in the broad field of Medical Education for the past four decades. In this research, we adapted this assessment strategy for secondary teacher education transforming it into an instructional strategy for fostering self-regulated learning. 420 teachers-to-be participated in this study within a blended course of Educational Psychology. Each individual responded to a CBM-test on reading comprehension questions concerning nine different curricular texts with ten items each. At the end of the course, the students evaluated the experience by answering a survey. We present results of the students' responses to the CBM-tests; and their evaluation of the instructional experience and their improvement suggestions. These students' evaluations present a challenge for teacher educators and invite to use the CBM strategy for qualitative, formative assessment in areas which up to now did not consider it.

Intercultural evidence of a Tablet based executive functions test for children between 7 to 10 years

Keywords: Assessment methods and tools, Cognitive development, Developmental processes, Educational technology

Presenting Author: Ricardo Rosas-Díaz, CEDEti-UC, Chile; **Co-Author:** Victoria Espinoza, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Marion Garolera, Pontificia Universidad Católica de Chile, Chile

Executive functions (EF) have been shown as one of the best predictors of school attainment and success. One of the dominant models of EF (Diamond, 2013) distinguishes three main components: Cognitive and behavioral Inhibition, Working Memory and Cognitive flexibility. Inhibition refers to the ability to suppress concurrent stimuli to the task that is supposed to be solved; working memory is the capacity of the cognitive system to manage simultaneous information and cognitive flexibility is the ability to find alternative correct ways to solve a given problem. We developed a tablet-based test with four tasks to assess EF: one for each of the EF components and one considered as the gold standard for its assessment. We assessed to date 705 children between 7 and 10 years, from Chile (237), Argentina (116), Australia (49), UK (209) and Norway (94). Our principal results to date are: The test shows good reliability indicators (Cronbachs alpha ranging from 0,7 to 0,9) Differences between countries are relatively small (and can be explained considering the kind of educational system included in the study in each country) Increases with age in all of the tasks are consistent between the different countries. This will be discussed as a validity indicator. This research is in progress. According to our plan, we will have other results to show in the conference, mainly: Evidence of concurrent validity with the WISC V Profiles of typical vs ADHD children Results from a Brazilian and an Equatorian sample

Development and validation of the Playgroup Environment Rating Scale (PERS)

Keywords: Content analysis, Early childhood education, Qualitative methods, Video analysis

Presenting Author: Vanessa Russo, University Institute of Lisbon (ISCTE - IUL), Portugal; **Co-Author:** Clara Barata, University of Coimbra, Portugal; **Co-Author:** Joana Alexandre, University Institute of Lisbon (ISCTE-IUL), Portugal; **Co-Author:** Catarina Leitão, University of Coimbra, Portugal; **Co-Author:** Bruno de Sousa, University of Coimbra, Portugal

Playgroups are community-based services that bring together young children and their caregivers for the purpose of play and social activities. International studies have reported significantly better outcomes for children who participate in playgroups (e.g. child language), compared to those that do not participate. Prior evidence show that documented playgroup impacts may be dependent on the quality of the playgroup. To date, there is no adequate measure of playgroup quality. This presentation describes the development and validation of the Playgroup Environment Rating Scale (PERS), a system for specifically observing the quality of the environment in playgroups. The initial review demonstrated that traditional measures used to evaluate the quality of ECEC are useful overall for comparisons of quality, but may not be sufficient in capturing dimensions of quality that pertain to the nature of playgroups. Developing the PERS entailed a review of the literature on quality indicators in early childhood education and care (ECEC) and systematic fieldwork in playgroups. The validation included the coding of 24 playgroup videos with the PERS, an interview with 10 facilitators, and finally the Adult Style Observation Schedule (ASOS), another measure of quality in ECEC, was used to provide initial evidence for construct validity. Preliminary findings support the reliability of the quality indicators that make up the PERS. The measure has good inter-rater agreement and is internally consistent. Correlations with the ASOS provided initial evidence of construct validity. This presentation will also include results of the analysis of concurrent and predictive validity.

Session F 15

13 August 2019 12:00 - 13:30

Seminar Room - S14

Single Paper

Assessment and Evaluation, Educational Policy and Systems

Educational Effectiveness and Quantitative Methods

Keywords: Achievement, Comparative studies, Competencies, Educational attainment, Quantitative methods, School effectiveness, Secondary data analysis, Self-efficacy, Survey Research, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 18 - Educational Effectiveness, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Eero Ropo, Finland

Evidence for the Design of Cluster-Randomized Intervention Studies on Students' Competencies

Keywords: Competencies, Quantitative methods, School effectiveness, Secondary data analysis

Presenting Author: Sophie Stallasch, University of Potsdam, Germany; **Co-Author:** Oliver Lütke, Leibniz Institute for Science and Mathematics Education

(IPN), Kiel, Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories (LIfBi), Bamberg, Germany; **Co-Author:**Martin Brunner, University of Potsdam, Germany

To plan cluster-randomized experiments (where entire classes or schools are randomly assigned to treatment conditions) with sufficient power to detect the effects of educational interventions on students' competencies, researchers need multilevel design parameters: (1) Intraclass correlations at the class and school level, and (2) the amount of variance explained by covariates at the student, class, and school level. Most previous research on design parameters stems from the US, focuses on two-level designs, and remains limited to main competence domains (i.e., mathematics, reading, science). Capitalizing on representative data of students attending grades 1 to 12 from the German National Educational Panel Study (sample sizes varied between $N = 3,963$ students from 168 schools and $N = 14,640$ students from 518 schools), the authors used three-level latent (covariate) models to provide design parameters for main competence domains as well as further verbal skills and domain-general competencies that have not been examined before. Three covariate sets were applied comprising (a) sociodemographic characteristics, (b) pretest scores, and (c) a combination of both. Intraclass correlations as well as the amount of variance explained by the various covariate sets varied considerably depending on the grade level, the level of analysis, and the competence measure under investigation. The results highlight that design parameters should fit to the target population, level of analysis and outcome domain when planning cluster-randomized intervention studies.

The continuing effect of primary school on secondary school achievement.

Keywords: Achievement, Educational attainment, Quantitative methods, School effectiveness

Presenting Author:Melvin Chan, National Institute of Education, Singapore

A considerable body of research in the school effectiveness literature shows that differences in school quality significantly impact student outcomes. While most research have focussed on short-term immediate school effects, there is much less conclusive research on the long-term or "continuing school" effects of the relationship between the primary school that students' attended and their attainment levels at the end of secondary school. This aim of this study was to investigate the continuing effects of primary school (aged 12 years) on secondary school (aged 15 years) achievement in Singapore. Employing a cross-classified multilevel model, resulted indicated negligible primary school effects. Students who belonged to the same primary school can be expected to perform at a range of achievement levels at secondary schools. Therefore, our results showed that the primary school effect is not as large as previous studies have indicated and as public discourse suggests.

Comparing Teaching Practice Items across Countries: Using Network Analysis

Keywords: Comparative studies, Quantitative methods, Survey Research, Teaching/instruction

Presenting Author:Jessica Fischer, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Jia He, TilbuDIPF, China; **Co-Author:**Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany

Teacher's instructional practice is considered one of the most important factors influencing student learning outcomes. Educational large-scale assessments mostly operationalize teaching practice as a multidimensional construct, and factors such as teacher-directed instruction, student-orientation, and formative assessment have been highlighted. Yet, empirical data show that factor structures of teaching practice vary across countries. Using PISA 2012 data, this study investigates patterns of 13 teaching practices in different cultural contexts with factor analyses and with an alternative look on interactions among these items, namely with psychological network analysis. The main findings include that (1) the factor structure of teaching practices differed across countries and the expected three-factor structure could largely be identified in German-speaking countries only; (2) partial correlation networks showed strongest interactions between items belonging to the same sub-dimension in German-speaking countries, whereas in Spanish-speaking countries, strong partial correlations were also present among items of different sub-dimensions of teaching practices; (3) items supposedly measuring formative assessment did not cluster together strongly, and they showed strong distinct correlations with either student- or teacher-directed practices; and lastly (4) the importance of individual teaching practices differed between German- and Spanish-speaking countries, except that informing students about their strength and weaknesses in mathematics had a central role in all countries. Implications are discussed.

Comparing Teacher self-efficacy in Anglo-Saxon, Nordic and East- & South-East Asian countries

Keywords: Quantitative methods, Secondary data analysis, Self-efficacy, Teacher Effectiveness

Presenting Author:Sina Fackler, Leibniz-Institute for Educational Trajectories (LIfBi), Germany

This study investigates teacher self-efficacy (TSE) across the three domains of instruction (ITSE), student engagement (ETSE) and classroom management (MTSE) across three country clusters comprising Anglo-Saxon, Nordic and East & South-East Asian countries. It was possible to show how teacher-, classroom-, principal- and school characteristics are related differently to each of the domains and country clusters and explain variation across levels in a multi-level analysis. This study aims at shedding light onto how features of the school systems unique to each cluster and cultural characteristics, which are deemed to shape the work environment of teachers, may inform their sense of self-efficacy and explain differences between them. It furthermore provides information on levers for education policy or teacher training and thus shapes the future of education.

Session F 16

13 August 2019 12:00 - 13:30

Seminar Room - S02

Single Paper

Motivational, Social and Affective Processes

Motivation and Emotion

Keywords: Achievement, Attitudes and beliefs, Collaborative Learning, Emotion and affect, Goal orientation, Higher education, Mixed-method research, Motivation, Motivation and emotion, Out-of-school learning, Peer interaction, Secondary education, Self-efficacy, Social aspects of learning and teaching

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Ingeborg Kränge, Department of Teacher Education, Norway

I'd rather work alone. Insight into students' recovery from teamwork and independent work.

Keywords: Achievement, Motivation and emotion, Peer interaction, Social aspects of learning and teaching

Presenting Author:Sigrid Wimmer, University of Graz, Austria; **Co-Author:**Manuela Paechter, University of Graz, Austria; **Co-Author:**Ilona Papousek, University of Graz, Austria; **Co-Author:**Helmut Karl Lackner, Medical University of Graz, Austria

Presentations in a seminar may cause enormous stress for students. However, students' experiences of these situations in part depend on how they cope with academic stressors. This implies not only their investment of energy to overcome the situation, but even more their adaption after the stressful event. Environmental characteristics of the situation, such as the size of the audience or the mode of presentation, may affect coping and adaptation after a presentation. In a sample of 69 university students, the present study investigated the impact of characteristics of the performance situation on how efficiently students may recover from a challenging presentation in a university seminar. Recovery was assessed using psychophysiological measures in terms of heart rate and heart rate variability. In contrast to previous studies, present results indicate that a smaller audience may cause more rumination about one's performance and thus poorer recovery compared to a larger audience. Moreover, presenting in a team may impair recovery as well. Co-presenters may limit the perceived influence on the performance and may hamper adaptive coping with academic stress.

University Instructors' Achievement Goals and Subjective Well-being

Keywords: Emotion and affect, Goal orientation, Higher education, Motivation

Presenting Author:Raven Rinas, Augsburg University, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany

Well-being of university instructors is important not only for their own work experiences but also for their students' educational experiences (Jennings & Greenberg, 2009). Researchers have used achievement goal theory to explain differences in instructors' experiences, including positive affect (Daumiller et al., 2018). However, as well-being is multi-faceted consisting of both emotional and cognitive aspects, a more comprehensive understanding is necessary. This is especially important for instructors as they report high levels of occupational stress and difficulties maintaining work-life balance (Lackritz, 2004). Since different achievement goals underlie interpretations, experiences, and behaviors in achievement situations (Daumiller et al., 2018), it can be assumed that they are differentially related to aspects of instructor well-being, particularly depending on the alignment of their goals with their work expectations. First investigations for school teachers looked into work stress (Nitsche et al., 2013), however, nearly no research exists on university instructors and no investigations of other factors of well-being. Our study examined instructors' goals and multiple facets of their well-being. An international sample of university instructors from Germany ($N=817$), the United States ($N=456$), and China ($N=402$) completed measurements of goals and well-being (satisfaction with life, work stress, and teaching emotions). Structural equation modelling revealed task approach goals to have positive associations with well-being, while the opposite was found for task avoidance, work avoidance, and appearance approach goals. Contrary to expectations, relational goals had negative associations with satisfaction with life. Based on this, future research avenues and implications for the improvement of instructor well-being are discussed.

Industry-school projects as an aim to foster secondary school students' interest in STEM careers

Keywords: Attitudes and beliefs, Mixed-method research, Out-of-school learning, Secondary education

Presenting Author:Robbert Smit, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Nicolas Robin, Fachdidaktik Naturwissenschaften, Switzerland; **Co-Author:**Christina De Toffol, University of Teacher Education St.Gallen, Switzerland

School-industry partnerships offer authentic learning opportunities and can support the development of interest in a STEM-career. The expectancy-value model of achievement related choice helps to explain how several factors influence career choice. Interest-enjoyment values and attainment values are most important in the students' motivation to participate in out-of-school technology and design activities. Our research question is the following: Is there a development in the students' career interests in STEM-related professions over time? We employed a longitudinal, quantitative research design. The sample consists of 213 students from 3 school-industry projects and 72 students from 4 classes in 4 neighbouring schools who serve as a control group. All of the students filled out a questionnaire before and after the visit. The items of the questionnaire were based on existing scales relating to an expectancy-value model. Results show that career choice in STEM-fields declined a little in the intervention group and also with a small effect compared to the control group. A further investigation of the relationship of the two predicting factors "expectancy" and "applying" helps to explain the development of STEM career choice. The longitudinal two-group structural equation model shows that in the intervention group applying science-based technology activities predicts career choice, while this factor is not of relevance in the control group. This result shows that factory visits combined with embedded tasks are one way to overcome fixed self-concepts and allows the students to reconsider towards the end of secondary school a career in the engineering industry.

Collective efficacy, proxy efficacy, friendship-acquaintance groupings, and group performance

Keywords: Attitudes and beliefs, Collaborative Learning, Motivation, Self-efficacy

Presenting Author:Jose Hanham, Western Sydney University, Australia; **Co-Author:**John McCormick, University of Wollongong, Australia

Abstract Background/purpose. Presently, little is known about the motivational processes that underlie student group work with groups of friends or acquaintances in schools. This study seeks to advance knowledge of social-cognitive factors that may predict the performances of friends and acquaintances during group-based activities. Drawing on Bandura's Social-Cognitive Theory, we theorised that when working in groups comprised of friends or acquaintances, students would develop shared beliefs about their group's capabilities for performing tasks (collective efficacy), as well as beliefs about the capabilities of individual group members to perform specific roles on behalf of the group (proxy efficacy). We explored interactions involving collective efficacy, proxy efficacy, and group membership (friends/acquaintances), with group performance. **Design/method.** A longitudinal design was employed, involving the administration of a survey at weeks 1, 3 and 5 with a sample of 164 male students in Grade 8 from a Catholic Boys High School, located in the Sydney, Australia. Sociometric procedures were used to assign students into 20 acquaintance groups and 21 friendship groups. Each group comprised 4 students completing group assignments in Religious Studies and Geography. Data were analyzed using multilevel modelling. **Results.** In religious studies, statistically significant interactions involving group membership and collective efficacy, predicted group performance. In Geography, a statistically significant interaction involving group membership and proxy efficacy predicted group performance. **Conclusions.** It may be advantageous for teachers to assign students to friendship groups, provided that they nurture collective efficacy and proxy efficacy beliefs.

Session F 17

13 August 2019 12:00 - 13:30

Seminar Room - S10

Single Paper

Assessment and Evaluation, Instructional Design, Learning and Instructional Technology

Online Measures of Learning Processes

Keywords: Assessment methods and tools, Cognitive skills, E-learning/ Online learning, Educational Psychology, Educational technology, Experimental studies, Instructional design, Problem solving, Problem-based learning, Quantitative methods, Secondary data analysis, Self-regulation, Student learning, Teaching/instruction

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Tobias Halbherr, Switzerland

Measuring cognitive load during online complex learning

Keywords: Cognitive skills, E-learning/ Online learning, Instructional design, Problem-based learning

Presenting Author:Charlotte Larmuseau, KU Leuven, Belgium; **Co-Author:**Pieter Vanneste, KU Leuven, Belgium; **Co-Author:**Piet Desmet, KU Leuven KULAK, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Cognitive Load Theory (CLT) contains the most influential theoretical explanations of cognitive processing during learning. Despite its success, attempts to assess cognitive load (CL) during learning have been proven difficult. Therefore, in the current study, students' self-reports of their intrinsic, extraneous, germane CL and mental effort invested after the learning process, have been combined with measures of physiological data, namely, electrodermal activity (EDA) and skin temperature (ST). Data was collected from 15 students from primary education teacher training, during a high and low complex task about learning and teaching geometry. Task complexity was based on the level of element interactivity as defined by CLT. A first aim was to investigate whether there were significant differences between the high and low complex task with respect to the self-reported CL as well as the physiological data. A second aim was to link self-reported CL with physiological data for both the high and low complex task intervention. Results reveal that perceived intrinsic CL and mental effort significantly differed between the high and low complex task, but that these differences were not reflected by EDA and ST. Furthermore, during the high complex task, EDA correlated significantly with extraneous CL and mental effort. Additionally, during the low complex task, intrinsic CL and EDA were significantly interrelated. These findings indicate that dependent on the task complexity differences with respect to different types of cognitive load are reflected by differences in EDA.

How Experts Change Their (Viewing) Behavior When Modeling a Task to Novices

Keywords: Educational technology, Instructional design, Problem solving, Teaching/instruction

Presenting Author:Selina Nadine Emhardt, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Ellen Kok, Utrecht University, Netherlands; **Co-Author:**Saskia Brand-Gruwel, Open University of the Netherlands, Netherlands; **Co-Author:**Christian Drumm, Department of Business Studies, Aachen University of Applied Sciences, Germany, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Instructional videos are gaining popularity, for instance on online learning platforms. Indeed, videos that display an expert ('s eye movements) while demonstrating how to perform a complex problem-solving task, such as code debugging, has the potential to foster novices' learning. To study the cognitive and perceptual challenges novices usually face during code debugging, our first aim was to investigate how novices' debugging behavior and eye-movement patterns differ from those of experts. Experts showed shorter fixations in the code area, tested the code less often, and debugged the code more linearly compared to novices. These expertise-related differences in attention allocation and debugging behavior suggest that novices might benefit from attention guidance of experts. However, following authentic expert behavior might be challenging for novices. This is why expert models are typically instructed to behave didactically, yet it is not known how this affects experts' behavior. Thus, the second aim of this study was to explore how experts change their eye-movement patterns and mouse click behavior when explaining their task solution didactically. In comparison to experts' regular debugging behavior, didactically behaving experts showed longer fixation durations, shorter saccade amplitudes, ran the code less often, performed more transitions between code and output when running the code and debugged the code more linearly. Given that experts clearly change their (viewing) behavior in order to didactically guide a learner's attention, an interesting question for future research would be to investigate which expert instruction is most suitable for video-based modeling example for novice students.

Self-report vs. actual strategy use

Keywords: Assessment methods and tools, Experimental studies, Self-regulation, Student learning

Presenting Author:Daniel Schropp, Ulm University, Germany; **Co-Author:**Silja-Susann Taxis, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

The use of learning strategies is important for effective self-regulation. Therefore, a valid tool is necessary to measure learning strategies. Self-report questionnaires have the disadvantage to be retrospective and learners often overestimate their use of learning strategies. Additionally, questionnaires often failed in predicting learning outcomes. Another possibility is to record the actual strategy use by analyzing concrete strategy tracks like marks, notes, visualizations etc. in learning material. We analyzed with N = 98 students whether the two measures correlate with each other and whether they can predict learning outcomes. We found no correlation between the two methods and as expected no correlation between the self-report questionnaire and learning outcomes. In contrast, the measure of actual strategy use based on concrete strategy tracks significantly predicted learning outcomes. Therefore the analysis of concrete strategy tracks seems to be a valid tool to measure learning strategies and predict learning outcomes. The analysis also revealed that only very few students actually showed strategy tracks. Thus, one important practical implication is that teachers could gain insight in students learning material in order to analyze their strategy tracks and to foster a more intensive and effective strategy use.

Using sequence analysis to gain insight into students' behavior while solving complex problems

Keywords: Educational Psychology, Problem solving, Quantitative methods, Secondary data analysis

Presenting Author:Beate Eichmann, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:**Liene Brandhuber, Goethe-Universität Frankfurt, Germany; **Co-Author:**Johannes Naumann, University of Wuppertal, Germany

Complex problem solving is a crucial skill in today's society. However, studies like PISA 2012 report that roughly one in five students shows poor problem solving performance. In order to gain knowledge about the reasons why students have difficulties in solving complex problems we conducted sequence analysis using log data of a complex problem solving task from PISA 2012 (N=29975). Therefore, we compared the sequences of students' behavior stored in computer-generated log data to obtain clusters of similar sequences of behavior. As a result we identified three behavior patterns that were associated with high performance and three behavior patterns that were associated with poor performance. We found that a minimalistic problem solving approach as well as moderate exploration was linked to high success rates. However, excessive exploration and very short sequences were related to low success rates. Especially the behavior patterns associated with low performance point to different obstacles students encounter while solving complex problems.

Session F 18

13 August 2019 12:00 - 13:30

Seminar Room - S12

Single Paper

Learning and Instructional Technology

Educational Technology in Primary Education

Keywords: Computer-assisted learning, Computer-supported collaborative learning, Educational technology, Emotion and affect, Game-based learning, Learning and developmental difficulties, Mathematics, Mixed-method research, Primary education, Self-efficacy, Student learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Colin Jevons, Australia

Learning via embodied learning: Investigating the impact of a digital Vs a non-digital intervention

Keywords: Educational technology, Mathematics, Primary education, Student learning

Presenting Author:Yiannis Georgiou, Cyprus University of Technology, Cyprus; **Co-Author:**Andri Ioannou, Cyprus University of Technology, Cyprus; **Co-Author:**Panayiotis Kosma, Cyprus University of Technology, Cyprus

Despite the rapid development of motion-based technologies, their role in embodied learning, positive or detrimental, remains ambivalent. This study aimed at investigating the potential added value of motion-based technologies in embodied learning in the context of geometry elementary education. An explanatory sequential design was adopted, composed of two phases. First, an experiment was conducted: students in the experimental group (n=15) participated in a digital embodied learning intervention while students in the comparison group (n=16) participated in a non-digital embodied learning intervention. Data collection included baseline data, questionnaires investigating students' engagement, cognitive load and learning gains. Next, post-interventional interviews were conducted. Quantitative results showed that, while students' cognitive load was not differentiated, students in the digital intervention outperformed their counterparts in the non-digital intervention, in terms of learning gains and emotional engagement. Analysis of the interview data allowed a better understanding of students' engagement and cognitive load supporting the quantitative findings.

Children's self-efficacy beliefs impact the efficiency of game-based learning

Keywords: Game-based learning, Learning and developmental difficulties, Primary education, Self-efficacy

Presenting Author:Miia Ronimus, Niilo Mäki Institute, Finland; **Co-Author:**Ritva Ketonen, University of Helsinki, Finland

Self-efficacy beliefs have been associated with children's academic achievement, but previous findings are unclear about the directionality, that is, if self-efficacy predicts future learning, or whether self-efficacy is mainly the result of past achievement (Talsma et al., 2018). We report results from two game-based RCT reading interventions which suggest that self-efficacy may have an important role in predicting the efficiency of game-based learning. The participants were first graders identified with severe difficulties in reading acquisition, and the interventions utilized GraphoLearn (GL), a digital game designed to train letter-sound correspondences and word decoding. The first intervention compared two GL groups training either reading skill (n=23), or both reading and spelling skills (n=24) with the game (in addition to school-provided support), to school-provided support not including GL (n=23). The results showed no differences between the groups in reading or spelling development, but further inspection revealed that the results were moderated by self-efficacy beliefs: the children who had high self-efficacy before the intervention benefited more from GL reading training than high self-efficacy children in the control group. For the second intervention GL was modified to provide informative performance feedback, which was expected to encourage children to focus on training more effectively, irrespective of the level of self-efficacy. GL Feedback (n=25) was compared to standard GL (n=25) (which gave generic positive feedback regardless of performance) and to typical support (n=25). The results supported the hypothesis: if the game had been used regularly, the feedback version seemed to lead to best reading achievement.

Single vs. multi-touch interfaces for collaborative learning with tablets

Keywords: Computer-supported collaborative learning, Educational technology, Emotion and affect, Primary education

Presenting Author:Armin Weinberger, Saarland University, Germany; **Co-Author:**Lara Johanna Schmitt, Saarland University, Germany; **Co-Author:**Dimitra Tsovaltzi, Saarland University, Germany

Collaborative learning with a shared-touch interface involves learners with their whole bodies on multiple modes of interaction. The embodied cognition perspective emphasizes the role of sensorimotor, bodily experiences for cognitive processes such as learning. Embodied learning environments explicitly incorporate the body and bodily movements to increase learning opportunities. In our study with the 'Proportion' tablet app, we investigate the role of single vs. multi-touch interfaces for how learners coordinate their joint learning processes and learning outcomes in such an embodied learning environment. Overall, the learning processes were favorable, however, the structuring seemed to be only of limited relevance. We discuss these results against the backdrop of embodied cognition and structuring coordination in collaborative learning experiences.

App clusters: Patterns of combined app use and their relation to learning

Keywords: Computer-assisted learning, Educational technology, Mixed-method research, Primary education

Presenting Author:Sarah Howard, University of Wollongong, Australia; **Co-Author:**Karl Maton, University of Sydney, Australia

The world of digital technologies, and in particular educational apps, is difficult to navigate. While apps have been present in schools for several years, a critical question remains: how do they relate to learning? Given the importance of quality early education, and the high use of apps by young children, this problem has become particularly concerning. Without a way to critically evaluate and select apps, parents and teachers struggle to usefully select and integrated apps into young children's play and learning. Research has shown that what matters in technology integration is not an individual digital tool, but the wider context of learning. Therefore, is essential that the field gains a better understanding of young children's combined app use, as apps are rarely used in isolation. This paper addresses this question, through an analysis of young children's combined real app use across Australia, through analysis of a large aggregated dataset of app use in primary school classrooms (Years K-3; Ages 5-9) over two years. Data mining approaches, association rules and clustering, are used to identify patterns and types of app use. Five distinct patterns of combined app use were identified. The underpinning principles of patterns were investigated to explore their possible relation to learning using sociological theory. Implications for teaching and learning are addressed.

Session F 19

13 August 2019 12:00 - 13:30

Seminar Room - S04

Single Paper

Teaching and Teacher Education

Writing and Literacy

Keywords: Communities of practice, Design based research, Educational attainment, Educational Psychology, Knowledge creation, Motivation and emotion, Quantitative methods, Secondary education, Teaching approaches, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Taiga Brahm, University of Tübingen, Germany

Partnering with practitioners to raise achievement: Methodological challenges for robust research

Keywords: Communities of practice, Design based research, Educational attainment, Writing/Literacy

Presenting Author:Judy M. Parr, University of Auckland, New Zealand; **Co-Author:**Rebecca Jesson, University of Auckland, New Zealand

This paper explores the challenges of combining "rigor and realism" (Snow, 2015) in intervention work in education. Problems persist in transferring positive findings from research, conducted in relatively constrained contexts with researcher-led design and oversight, to normal classroom contexts; of applying findings 'at scale', and of sustaining any effects. A means of addressing these problems includes engagement in forms of research-practice partnership. Increasingly it is acknowledged that solving endemic problems in educational settings requires distributed expertise (McNaughton, 2011), marrying research-based and professional knowledge. Collaborative partnerships involve deep understanding on the part of researchers of the realities of practice and of teacher learning, and the building of relational trust (Bryk & Schneider, 2003). Researchers require considerable skill in formulating pragmatic research designs, devising "smart" data collection tools and processes that are truly inclusive of professional expertise and serve the dual purposes of research endeavour and informing and sustaining effective practice and ongoing professional learning. Drawing on several successful collaborations aimed at addressing student underachievement in writing, the paper presents a typology of research approaches that seek to do this. Examples include: the processes of arriving at the "research question"; forms of quasi-experimental designs used; devising and implementing collaboratively a schedule to observe writing instructional practice to identify strengths and areas for improvement but also to use as a data collection and a professional learning tool; designing respectful ways to establish teacher knowledge that later serve professional learning and adapting student interview questions for use by teachers to inquire into their practice.

Mediating Effects of Writing Achievement Goals on Self-Efficacy and Affect in Secondary School

Keywords: Motivation and emotion, Quantitative methods, Secondary education, Writing/Literacy

Presenting Author:Buket Akkoyunlu, Çankaya University, Turkey; **Co-Author:**Meryem Yılmaz Soylu, Independent researcher, Turkey

Achievement goal theory describes human as being goal directed. Research has generally shown that achievement goals predict students' motivation, and self-beliefs. The aim of this study is to explore relationships among writing achievement goals, self-efficacy and affect. Three hundred thirteen 7th and 8th grade students from a private school in Ankara, Turkey participated the study. The majority of participants were 7th graders (n = 177). Of those reporting gender (n = 313), 161 were boys and 152 were girls. Mean reported age was 12.68. Data were collected with several scales including the Writing Achievement Goals Scale, Self-Efficacy for Writing Scale, and Liking Writing Scale. The theoretical model represents relationships among writing achievement goals, writing self-efficacy and affect using structural equation modeling including students' responses to the study scales. Results from the analysis revealed that there is a good fit between a model depicting hypothesized relations among the constructs and the data. Overall, all of the achievement goals showed a direct relationship with writing self-efficacy. However, the strength and direction of this relationship differed in components of both achievement goals and self-efficacy. Contrary to performance approach goals, mastery goals and performance avoidance goals had a direct relationship to liking writing. Moreover, liking writing almost equally and positively impacted all components of self-efficacy for writing.

Understanding Writing-to-Learn – Approaches and Educational Implications

Keywords: Educational Psychology, Knowledge creation, Teaching approaches, Writing/Literacy

Presenting Author:Markus Linnemann, University of Koblenz-Landau, Germany

Writing competence is one of the key competences in a highly literate society, and its instruction is one of the central purposes of school education. Writing plays a vital role in all school subjects: (1) Writing can be used to enhance students' knowledge and understanding of a particular subject. In contrast to spoken language written language leaves a permanent record that can be reflected upon. (2) Writing can provide writers with the opportunity to take part in specialist discourse. Even if this is proven by empirical evidence of single studies and also meta-studies and proven by practitioners alike, the mechanisms of the epistemic effect are mostly still unknown. The approaches explaining writing-to-learn effects focus on *specific processes* in writing, for example shaping at the point of utterance while generating a text or editing and revising a previously written text. On the other hand, some approaches focus on *specific requirements* such as the communicative goal, the addressee or the genre. In the current paper all approaches will be explained based on the model of the writing process by Hayes (2012). It will be theorised which subprocesses of the model are included in the various approaches. It will be shown, that writing tasks based on the genre approach utilize most of the subprocesses of the Hayes model are proven to be the most effective writing-to-learn-tasks. Additionally this theoretical paper will discuss the psychological and educational implications from the writing-to-learn approaches.

Session F 20

13 August 2019 12:00 - 13:30
Lecture Hall - H06 - Amazon Hörsaal
Single Paper
Higher Education

Mixed-method Research in Higher Education

Keywords: Competencies, Comprehension of text and graphics, Emotion and affect, Higher education, Learning approaches, Mixed-method research, Motivation and emotion, Qualitative methods, Quantitative methods, Quasi-experimental research, Teaching approaches

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 04 - Higher Education

Chairperson: Mei-Shiu Chiu, National Chengchi University, Taiwan

Just boring or even enjoyable? Students' achievement emotions in higher education courses

Keywords: Higher education, Mixed-method research, Motivation and emotion, Teaching approaches

Presenting Author: Barbara Jacob, Friedrich-Alexander University Nuremberg, Germany; **Co-Author:** Florian Hofmann, Institute for Educational Science, University of Erlangen-Nuremberg, Germany; **Co-Author:** Melanie Stephan, University of Erlangen-Nuremberg, Germany; **Co-Author:** Katharina Fuchs, Institute for Educational Science, University of Erlangen-Nuremberg, Germany; **Co-Author:** Stefan Markus, University of Wuppertal, Germany; **Co-Author:** Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany

Students' achievement emotions are important for learning and academic success. Thus, teaching approaches and learning situations in higher education should focus not only on cognitive outcome but on students' affective learning aspects, as well. The study we will present analyses the influence of teaching approaches (student-oriented vs. teacher-centered) on achievement emotions of higher education students. Based on the self-determination theory (Deci & Ryan, 2002), we developed a student-oriented and a teacher-centered instructional setting. With respect to self-determination theory, we expected a higher level of positive emotions (e.g., enjoyment) and lower level of negative emotions (e.g., boredom) in the student-oriented setting due to autonomy-enhancement. The quasi-experimental and mixed-methods study was carried out with two university lecturers and 217 students at a German university based on surveys and video-analyses. The students participated in nine sessions of a teacher training course in school education. The average age of the students was 21 years (SD = 4.3), 79 percent of the students are female, 92 percent are enrolled in the first semester. The results shows that enjoyment and boredom are experienced most often in both instructional settings. As assumed, students experienced a higher level of autonomy and participation in the student-oriented setting compared to the teacher-centered setting. But in the teacher-centered settings surprisingly a higher level of students' enjoyment and a lower level of boredom were found. Main results of the study and implications for teaching in higher education will be discussed.

Dental Medical Students' Competencies for Identifying Anomalies in X-rays: When Do They Develop?

Keywords: Competencies, Comprehension of text and graphics, Higher education, Quasi-experimental research

Presenting Author: Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Thérèse Eder, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:** Juliane Richter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Fabian Hüttig, Tübingen University Hospital Center for Dentistry, Oral Medicine, and Maxillofacial Surgery, Germany; **Co-Author:** Constanze Keutel, Tübingen University Hospital Center for Dentistry, Oral Medicine, and Maxillofacial Surgery, Germany

In dental medical education, X-rays are the most common source of diagnostic information that needs to be interpreted by medical professionals. From expert-novice comparisons it is known that there are pronounced differences between medical students and medical professionals in the way they inspect medical images and in the ability to detect anomalies. To answer the question whether and how diagnostic competencies develop already during study, it was investigated how diagnostic performance and image reading behavior as measured by eye tracking differs between dental medical students from different semesters when they are asked to identify anomalies in dental X-rays. Diagnostic accuracy and eye tracking data resulting from an inspection of 10 X-rays for each individual were analyzed for a total of 280 data sets. Results revealed that while students' clinical knowledge on anomalies advanced across five clinical study semesters, there was no improvement in their ability to detect anomalies. Moreover, anomalies were attended to with the same frequency across semesters, but earlier for more advanced students. Overall, results suggest that the relatively high diagnostic performance typically observed in medical experts is acquired after studies, namely, at the workplace. Nevertheless, it seems worthwhile to investigate ways of training diagnostic competencies already at the university, where systematic training approaches can be more easily implemented and learning processes are in the focus rather than occurring incidentally as is the case at the workplace.

International degree students' perceptions on how the university could enhance their study wellbeing

Keywords: Higher education, Motivation and emotion, Qualitative methods, Quantitative methods

Presenting Author: Viivi Virtanen, University of Helsinki, Finland; **Co-Author:** Sara Rönkkönen, Aalto-University, Finland; **Co-Author:** Mikko Inkinen, Aalto University, Finland; **Co-Author:** Minna Nevala, Aalto University, Finland; **Co-Author:** Merita Petäjä, Aalto University, Finland

At present, most universities aim to increase international student enrolment by enhancing the attractiveness of their degree programmes. However, the university strategies may struggle with foreseeing the consequences of the kind of internationalization from the student point of view (Schartner and Cho, 2017, Vinther and Slethaug, 2015). Hence, previous research indicate that the international students encounter a variety of academic, cultural and social challenges in their learning environments abroad, and their experiences are currently inadequately understood (McLachlan and Justice 2009; Sakurai et al. 2016; Young et al. 2015).

In this study, our aim is to understand the experience of international degree students' study well-being. Firstly, we are focusing on how the international degree students differ from domestic degree students in certain areas of study well-being by comparing the international students' and domestic students' responses to study well-being inventory. Secondly, we are focusing on international degree students' perceptions on how the university could enhance their study wellbeing, based on the qualitative data collected by study well-being questionnaire.

Psychological flexibility and organised studying to lower stress and improve well-being of students

Keywords: Emotion and affect, Higher education, Learning approaches, Mixed-method research

Presenting Author: Saku Määttä, University of Turku, Finland; **Co-Author:** Henna Asikainen, University of Helsinki, Finland; **Co-Author:** Nina Katajavuori, University of Helsinki, Finland

Given the rise in prevalence of stress among University students, promoting students well-being and study practices has become very important. While psychological flexibility a.k.a. dealing with negative emotions and being present has proven to increase sense of well-being and lower stress among working adults, it has not been widely explored in the University context. Organised studying has already been found to be an important factor in relation to academic achievement and study progress. The purpose of this study is to explore development of psychological flexibility and organised studying in relation to stress, well-being and studying. Total of 113 University students took part in a web-based course aimed at promoting students' well-being, stress management, psychological flexibility and organised studying. Development of the items were measured by questionnaires in the beginning and in the end of the course. Additionally, an learning report was conducted by the students at the end of the course where the students reflected on their development regarding general well-being, studying and learning during the course. Preliminary results show improvement in every item measured quantitatively. Additionally, the qualitative reports show that the students have acquired new skills to organise their studying as well as broad range of mental skills related to psychological flexibility. At the conference, we will elaborate our results more in depth as well as link the results to studying and academic achievement.

Session G 1

13 August 2019 13:45 - 15:15

SIG 5: Who benefits most? Differential Effects of Early Childhood Education and Care on child outcomes

Keywords: At-risk students, Cognitive development, Cognitive skills, Early childhood education, Educational policy

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Lars Burghardt, University of Bamberg, Germany

Organiser: Lars Burghardt, University of Bamberg, Germany

Discussant: Wilfried Smidt, University of Innsbruck, Austria

There is broad research that shows that the quality of Early Childhood Education and Care (ECEC) is crucial for children's development. While research on the overall importance of quality shows a clear trend: children benefit from developmentally appropriate practices that provide an optimal learning environment, one question needs further investigation: "Who benefits most?" There are theoretical, as well as empirical reasons for a need of a differential look on the outcomes of ECEC, as one can argue that specific children (e.g. from disadvantaged backgrounds or privileged children) may benefit more from high quality experiences in institutional childcare, than other children. The proposed symposium tackles this question. Findings from 3 countries are presented: Norway, Finland and Germany. The first presentation by Thomas Moser and Henrik Daae Zachrisson asks the question if Universal Early Childhood Education and Care is a protective mean for children from disadvantaged families in Norway. Here the results of four different Norwegian studies are presented and discussed. The second presentation by Anja Linberg, Lars Burghardt, Yvonne Anders and Hans-Günther Roßbach uses data of the German National Educational Panel Study to investigate the question if especially disadvantaged children benefit from ECEC (compensatory effect) or if children from a rather privileged background benefit more from ECEC (Matthew-effect). Simone Lehl, Hans-Günther Roßbach and Sabine Weinert use data of the German BIKSplus-study to investigate lasting preschool quality effects and the moderating role of potential risk factors. The last presentation by Marja-Kristina Lerkkanen, Jenni Salminen and Eija Pakarinen addresses the longitudinal effect of the quality of early teacher-child interactions on child outcomes, using a Finnish sample.

Universal ECEC as a protective mean for children from disadvantaged families in Norway?

Presenting Author: Thomas Moser, Universitetet i Sørøst-Norge, Norway; **Co-Author:** Henrik Daae Zachrisson, Department of Special Needs Education, Norway

We present a series of studies from Norway, where we show that universal ECEC from age 1 (at least partially) protects children from developmental risks associated with low family income. In study 1, we show that early ECEC, which expanded to cover about 80% of all 1-2 year olds in Norway, reduced social inequality in early language development (at age 3). In study 2, we demonstrate that children's early behavior problems are responsive to changes in family income among children in low-income families, while ECEC protects children from negative effects of low family income. Study 3 reveals that observed ECEC quality measured by ITERS is not associated with cognitive outcomes among 3 year olds, and there is no social gradient in the association between quality and child outcomes. In study 4, we show that focus on cognitive opportunities to learn in ECEC improves language skills at age 4, primarily for children of low educated mothers. This finding opens for discussions about the active ingredients in Norway's ECEC.

Compensation or Matthew-Effect? Relations of Child Care, Family and Child Development

Presenting Author: Anja Linberg, German Youth Institute, Germany; **Co-Author:** Lars Burghardt, University of Bamberg, Germany; **Co-Author:** Yvonne Anders, Freie Universität Berlin, Germany; **Co-Author:** Hans Guenther Rossbach, University of Bamberg, Germany

Different international and national studies point to relations between family, child care and child development. While some studies report, that especially disadvantaged children, like children with migration background or children from mothers with low educational background benefit from attending (a high quality) child care (compensation), other studies report seemingly contrary results: Not disadvantaged but children with a high stimulation at home profit from attending child care (Matthew-effect). These disparate results can partly be lead back to different measurement of the family context and child outcomes. As childcare systems differ widely across countries, it is essential to investigate the effect of ECEC in the specific context, in our case in Germany.

Using data of the Starting Cohort 2 of the German National Educational Panel Study (NEPS) we explore, which children particularly profit from attending child care. Therefore, different indicators are used in multiple models using one data set, in order to raise awareness, that different model specification and measurement could lead to different results and different policy and practice recommendations.

Lasting preschool quality effects and the moderating role of potential risk factors

Presenting Author: Simone Lehl, University of Bamberg, Germany; **Co-Author:** Hans Guenther Rossbach, University of Bamberg, Germany; **Co-Author:** Sabine Weinert, University of Bamberg, Germany

The present study investigates how preschool quality is associated with children's social and academic outcomes at age 12 and how effects are moderated by social background, the home learning environment (HLE) and early competencies by using data of the longitudinal study BIKSplus[3-13] (N=547). We found preschool quality measured by the Early Childhood Environment Rating Scale: Extension (ECERS-E) to be associated with lower conduct problems, and higher mathematical skills at age 12. Furthermore, early mathematical skills were found to moderate those associations: Children with lower initial mathematical skills at age 3 attending higher quality preschools showed better mathematical skills compared to their peers with lower initial mathematical skills in low quality preschools. When a child had better mathematical skills at the beginning of preschool, preschool quality had no additional effect on secondary school mathematical outcomes. Social background and HLE were no significant moderators. The study highlights the importance of high-quality preschools for math development in early adolescence especially for those children facing risk. Although children at risk do not profit most from preschool quality in comparison to their advantaged peers, preschool quality makes the difference for the children at risk.

The Longitudinal Effect of the Quality of Early Teacher-Child Interactions on Child Outcomes

Presenting Author: Marja-Kristina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:** Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:** Eija Pakarinen, University of Jyväskylä, Finland

Emotionally supportive, responsive and cognitively stimulating interactions and child-centered teaching practices have been shown to predict gains in child development in early childhood education and during early school years. The aim of the present study was to investigate the role of the quality of early teacher-child interactions in toddler classrooms in emerging academic and self-regulation skills later on at the age of 5. Children (n = 206) were tested at the age of 2-3 and again at the age of 5 in terms of emerging literacy and math skills as well as self-regulation skills. The quality of teacher-child interactions was assessed in toddler classrooms (n = 41) using the CLASS-Toddler observation instrument. The path models with Complex approach were constructed. The results indicated that after controlling for parental level of education, child gender and previous level of investigated variable, the quality of emotional and behavioral support in toddler classroom was related to children's better behavioral self-regulation skills later on. Furthermore, high quality of engaged support for learning was related to higher phonological awareness and emerging reading skills at the age of 5. The results imply that the interaction quality of ECEC classrooms has longitudinal benefits in terms of supporting children's emerging academic and self-regulation skills.

Session G 2

13 August 2019 13:45 - 15:15

Lecture Hall - H05

SIG Invited Symposium

Educational Policy and Systems, Learning and Instructional Technology, Teaching and Teacher Education

SIG 11: Innovative Research on Digital Tools and Their Use in Teaching and Teacher Education

Keywords: Assessment methods and tools, Biology, Computer-assisted learning, Computer-supported collaborative learning, Conversation/ Discourse analysis, Educational policy, Experimental studies, Learning Technologies, Multimedia learning, Pre-service teacher education, Reflection, Secondary education, Self-efficacy, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Annelies Kreis, Zurich University of Teacher Education, Switzerland

Chairperson: Inger Marie Dalehefte, University of Agder, Norway

Discussant: Alicia Alonzo, Michigan State University, United States

In teaching as well as in teacher education, digital tools play an increasing role. Digital innovations are met with a range of reactions between enthusiasm and rejection and mistrust. So, what are opportunities and risks of various digital tools such as digital portfolios, augmented reality learning environments, digitally supported case learning or digital mentoring for teaching and teacher education? What kind of methods are feasible for the exploration of these questions? In this invited symposium four projects which each cover frontline research about chances and risks of digital tools are presented and discussed. Contribution 1 explores the use of Augmented Reality in science education with future secondary school teachers. The study allows insights into experiences of students, didactical possibilities, potentials for learning, challenges and restrictions of Augmented Reality. Contribution 2 describes a quasi-experimental longitudinal study on the impact of peer feedback on perceived knowledge and self-efficacy regarding assessing learning strategies and giving feedback. Under experimental conditions student teachers were supported with a digital tool that offered a rubric with text modules. Contribution 3 explores the use of a mentoring and observation software (MOSO). The use of this software is explored with respect to its potential for assisting student teachers in theory-related planning, reflection and analysis of their teaching sessions. Contribution 4 focuses on communication processes and roles when different networks of actors are discussing a national curriculum through social media (Twitter). Can social media facilitate a discourse about educational topics and thereby contribute to professional development of individuals?

Possibilities, Challenges and Restrictions of Augmented Reality in Teacher Education

Presenting Author:Corinne Wyss, Zurich University of Teacher Education, Switzerland; **Co-Author:**Wolfgang Bühner, Zurich University of Teacher Education, Switzerland

The development of digital technologies has led to structural change in various areas. For the area of education, media and technologies can be used to facilitate teaching and learning. Great potential is attributed to Augmented Reality in this respect. Previous studies on the use of Augmented Reality in education have impressively demonstrated its positive effects on teaching and learning processes. Overall, however, there is little empirical evidence and therefore still a large research deficit. In the research project "Augmented Reality in Teacher Education - An exploratory study using HoloLenses in Science Education" (Alex), we explore the didactical possibilities, challenges and restrictions of Augmented Reality in education of secondary school teachers in science. In a specially designed teaching scenario, around 20 students of Zurich University of Teacher Education work with Microsoft HoloLenses and the App Molegram Explorer, which has been developed by afca in collaboration with ETH Zurich. Semi-structured interviews and video recordings are used to gain insights into students' experiences, learning and usage potential, and specific challenges. The presentation will outline how AR can support teaching and learning in teacher education and what has to be considered for the conception of corresponding learning scenarios.

Supporting Formative Peer-Feedback on Learning-Strategy Use by a Digital Tool

Presenting Author:Anika Bürgermeister, University of Leipzig, Germany; **Co-Author:**Inga Glogger-Frey, University of Freiburg, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany

Being able to formatively assess learning strategies is an important, but rarely addressed competence of teachers. Formative assessment consists of the two components of assessment and (formative) feedback. This study aimed at testing whether *each* of these two components (assessing, giving feedback) needs to be supported in teacher education in order to promote learning. In this quasi-experimental study, student teachers ($N = 129$) were asked to provide peer-feedback on learning-strategy application three times during a semester. With the help of a digital tool, they were supported either in assessment (A), in formulating the feedback (F), in both components (A+F) or not supported (Control). Supporting assessment was realized by *rubrics*. Supporting feedback was realized by procedural facilitation (text modules). Student teachers perceived their knowledge and self-efficacy regarding assessing learning strategies and giving feedback as higher after repeatedly giving and receiving peer-feedback. While in the middle of the semester, supporting the formulation of the feedback was especially beneficial (F), at the end of the semester the combination of fostering assessment as well as feedback was most advantageous (A + F). The findings strengthen the theoretical assumption, that assessment-related and instructional competencies, such as providing peer-feedback, seem to be distinct components that should be fostered individually and systematically.

Connecting Theory and Practice in Teacher Education by Means of Observation Software

Presenting Author:Aleksandra Lazareva, University of Agder, Norway; **Co-Author:**Peter Mathisen, University of Agder, Norway; **Co-Author:**Kari Midsund Nordbø, University of Agder, Norway

One of the existing challenges in teacher education comes from its division in the "theoretical" (i.e., on-campus) and "practical" (i.e., school placement for practical training) components. This often leads to the fact that theoretical and practical knowledge are seen by students as two separate forms of knowledge (Nordäng & Lindqvist, 2012). The main objective of this paper is exploring the opportunities offered by digital observation software to bridge the gap between the theoretical on-campus component and the practical training period. The research questions are formulated as follows: (1) What is the potential of digital observation software in assisting students in theory-grounded planning of their teaching sessions?(2) What is the potential of digital observation software in assisting students in theory-grounded reflection and analysis? (3) Do digital observation software help teacher students develop their professional language? A group of second-year students following a master's degree program in primary school teacher education ($N=70$) takes part in the pilot project focusing on the implementation of the MOSO software (MOSO, 2019) and pedagogical posters during the period of practical training. The project takes place during the Spring semester 2019, and the data will be collected through a student questionnaire distributed in the last phase of the project.

Rethinking the Role of Brokers - Dutch Educational Policy in the Twitterverse

Presenting Author:Martin Rehm, Pädagogische Hochschule Weingarten, Germany; **Co-Author:**Frank Cornelissen, University of Amsterdam, Netherlands; **Co-Author:**Alan Daly, University of California, San Diego, United States; **Co-Author:**Jonathan Supovitz, University of Pennsylvania, United States

Social media offers multiple parties (e.g. teachers) the opportunity to start bottom-up initiatives and possibly exert real influence on policy processes. This development has multiple implications. Previously established roles and steering mechanisms in the (educational) policy process must be put into disagreement and the government must assume a different role, such as that of a networked government. However, there is a lack of empirical research in this area. This raises the following question: What are the underlying communication processes when an educational policy is discussed through social media involving different networks of actors in the management of education? In November 2014, the Dutch State Secretary Sander Dekker initiated a national dialogue on the future curriculum for primary and secondary in various social media. This research investigates the nature of the pursuing dialogue on Twitter, in particular the way in which actors were possibly able to exert influence on the discussion. In this context, we build on social capital theory and use a mixed-method approach, utilizing (1) social network analysis, (2) bibliometric analysis and (3) qualitative interviews. Our results suggest that Twitter contributes to (individuals') social capital formation. Furthermore, employing a mixed-methods approach can be very useful for policymakers, as it highlights how more dynamic, fluid policy processes could be supported and influenced by discussions among stakeholders (e.g. teachers and educational professionals) within social media platforms. Moreover, our findings are also relevant for teacher education, as they highlight how social media spaces can be used to acquire information from colleagues and engage into a discussion about relevant educational topics, thereby contributing to individuals (informal) professional development.

Session G 3

13 August 2019 13:45 - 15:15

Lecture Hall - H07

SIG 12: Writing research from different perspectives

Keywords: Cognitive development, Cognitive skills, Comprehension of text and graphics, Cooperative/collaborative learning, Experimental studies, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Guido Nottbusch, University of Potsdam, Germany

Organiser: Guido Nottbusch, University of Potsdam, Germany

Discussant: Eva Lindgren, Umeå University, Sweden

The symposium is dedicated to shed some light on some selected aspects of writing, its acquisition and its teaching, representing a wide scope of writing research. Starting with the influence of higher cognitive processes on handwriting movements (here: pauses and non-automated movements in writing orthographically awkward words by expert and beginning writers) we move on to the influence of executive functions (here: working memory, cognitive flexibility, and inhibition) on text production in 2nd graders. The next step is an overview of effective writing interventions, highlighting two examples of teacher-based research. It will be discussed how this kind of research can contribute to the improvement of practice and the scientific knowledge base of writing. Finally, an experiment will be presented in which teachers of writing receive a training by professional writers. The hypothesis was that this experience would lead to changed understandings about learners' experiences of writing and thus to changed practice.

The relationship between executive functions and writing in elementary-school children

Presenting Author: Teresa Limpo, University of Porto, Portugal; **Co-Author:** Marisa Filipe, University of Porto, Portugal; **Co-Author:** Sofia Magalhães, University of Porto, Portugal; **Co-Author:** Carolina Cordeiro, University of Porto, Portugal; **Co-Author:** Andreia Veloso, University of Porto, Portugal; **Co-Author:** Andreia Nunes, University of Porto, Portugal; **Co-Author:** Thierry Olive, CNRS & Université de Poitiers, France; **Co-Author:** São Luís Castro, University of Porto, Portugal

According to Berninger's cognitive model of writing (Berninger & Winn, 2006), text production relies on the interaction between transcription and executive functions (EFs). Transcription allows the externalization of language into written text (handwriting and spelling), whereas EFs help individuals to self-regulate and engage in goal-directed behaviour. Compared to the amount of research examining the link between transcription and writing, empirical data on the role of EFs writing is scant, mainly in child writers. In this study, we examined the contribution of three core EFs (viz., working memory, cognitive flexibility, and inhibition) to writing quality in Grade 2 ($N = 350$, age 7-8), Grade 4 ($N = 350$, age 9-10), and Grade 6 ($N = 140$, age 11-12). For that, students participated in two individual sessions – where we administered several EF tests – and two group sessions – where they performed several writing tasks. We are currently analysing the data to examine the contribution of working memory, cognitive flexibility, and inhibition to writing in each grade. Theoretical implications for current cognitive writing models will be discussed along with the educational implications for the teaching and learning of writing.

Where do writers pause in orthographically awkward words?

Presenting Author: Guido Nottbusch, University of Potsdam, Germany

According to current models of handwriting, delays caused by higher cognitive processes (such as access to spellings) should arise several movements before the production of the actual tricky character(s) because of incremental processing. However, during handwriting children usually show delays right at the orthographic problem. It may be that this is a specific feature of developmentally unskilled spelling. For this study, skilled adults wrote orthographically awkward words (low frequency words with opaque phoneme-grapheme-correspondences) to dictation. The same words were afterwards copied several times for control. All the stimuli consisted of nouns containing a single opaque phoneme appearing earliest at the fourth letter (e.g. "Amalgam"). Writing movements were recorded by means of a digitizing tablet. Hesitating, pauses and non-automated writing movements were found word-initially as well as word-internally before and right at the opaque phonemes with the pen on paper as well as during in-air movements. Differences between beginning and skilled writers will be discussed.

Effectivity of Writing Interventions: for theory and practice

Presenting Author: Gert Rijlaarsdam, University of Amsterdam, Netherlands; **Co-Author:** Liselore van Ockenburg, University of Amsterdam, Netherlands; **Co-Author:** Anouk ten Peze, University of Amsterdam / Kennemer Lyceum Overveen, Netherlands; **Co-Author:** Tanja Janssen, Universiteit van Amsterdam, Netherlands; **Co-Author:** Daphne van Weijen, University of Amsterdam, Netherlands

We present two studies as cases how teacher-based research can contribute to the improvement of practice, and the scientific knowledge base of writing. The two cases are on creative writing in grade 10 and on synthesis writing in grade 9. Based on these two cases we will outline the design of the series of studies: which steps may contribute to success, with two perspectives: the science and the practice of writing education. Balancing between the role of teacher and researcher, functioning in the national teaching community and the international scientific community. We list ten recommendations for teacher-researcher intervention studies (maybe eleven). Case 1 is a study on the effects of an intervention on creative writing, on text quality and writing processes. Case 2 is a study on the basic strategies of writing a synthesis based on sources. Writing based on sources has a long tradition in the curriculum of Dutch, but instruction is scarce in secondary education.

Writing with Writers

Presenting Author: Debra Myhill, University of Exeter, United Kingdom

This presentation will report on a randomised controlled trial with a complementary qualitative process evaluation which examined the effect of a 'teachers as writers' residential on teachers' pedagogical practices and children's writing attainment. In the residential, professional writers led writing workshops and held individual tutorials with teachers to discuss their writing. Underlying the study was a hypothesis, much trumpeted within the arts and literacy practitioner domain, that experiencing first-hand 'being a writer' would lead to changed understandings about learners' experiences of writing and thus to changed practice. However, the randomised controlled trial showed a negative effect for the intervention. In this presentation, the findings will be discussed, drawing on both the statistical and the process data, and some explanatory conclusions will be offered. The process evaluation involved a fidelity check; a number of lesson observations; student interviews and teachers which provided rich insights into how the intervention was realised in practice.

Session G 4

13 August 2019 13:45 - 15:15

Lecture Hall - H09

Symposium

Learning and Special Education

Characteristics and Comorbidity of Mathematical Learning Difficulties

Keywords: Cognitive skills, Learning disabilities, Literacy, Meta-analysis, Motivation and emotion, Numeracy, Primary education

Interest group: SIG 15 - Special Educational Needs

Chairperson: Airi Hakkarainen, University of Eastern Finland, Finland

Organiser: Airi Hakkarainen, University of Eastern Finland, Finland

Discussant: Annemie Desoete, Belgium

Novel ways to study mathematical learning difficulties are needed to achieve more profound understanding of the development of these difficulties. This symposium will provide new knowledge on this field by presenting papers that use sophisticated analysing methods and novel approaches in studying the characteristics and comorbidity of mathematical learning difficulties. In this symposium, the focus is on how cognitive skills (Geary, 2011) and emotional factors such as math anxiety (Maloney & Beilock, 2012) affect performance on mathematics in different subtypes of mathematical learning difficulties. Huijsmans et al.

paper will add profound understanding of individual variation in performance on mathematics, as well as associated cognitive skills. Korhonen et al. paper will show that it is important to consider both cognitive and socio-emotional indicators alongside performance measures when studying mathematical learning difficulties. Sha discusses about the role of working memory related to the comorbid reading (RD) and mathematical (MD) difficulties. Friso-van den Bos et al. paper presents results from their meta-analysis and shows that children with mathematical learning disabilities (MLD) have deficits in working memory, number sense, and rapid automatized naming skills. **Keywords:** mathematical learning difficulties, comorbidity, cognitive skills, math anxiety, primary education

References Gears, D. C. (2011). Consequences, characteristics, and causes of mathematical learning disabilities and persistent low achievement in mathematics. *Journal of Developmental & Behavioral Pediatrics*, 32(3), 250–263. Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. *Trends in Cognitive Sciences*, 16, 404–406.

Individual Variation in Mathematics Performance: Behavioral and Cognitive Profiles

Presenting Author: Marije Huijsmans, Radboud University, Netherlands; **Co-Author:** Tijs Kleemans, Behavioural Science Institute (BSI), Radboud University, Netherlands; **Co-Author:** Evelyn Kroesbergen, Behavioural Science Institute (BSI), Radboud University, Netherlands

Research into cognitive phenotypes explaining individual differences in mathematics performance in typical developing (TD) children in general, and in children with mathematical learning disability (MLD) in particular has vastly expanded in the previous years. However, how different compositions of these cognitive skills together affect performance on basic arithmetic and advanced mathematics remains unclear. Therefore, the goal of the present study was to identify and clarify the behavioral and cognitive profiles of mathematics (i.e., basic arithmetic and advanced mathematics). Cognitive precursors in this study were number sense, nonverbal reasoning, working memory, and phonological processing. Cluster analyses in 281 fourth-graders revealed distinct profiles of mathematical performance in TD- and MLD-children, and provided indicators for associated cognitive difficulties. Two unidimensional profiles with consistently low and high achievers, as well as one selective profile of children with difficulties on advanced mathematics, nonverbal reasoning and working memory were retrieved from the data. Additional analysis with MLD-children only, showed two distinct profiles that were mainly differentiated by number sense skills. These findings contribute to a more profound understanding of individual variation in performance on basic arithmetic and advanced mathematics, as well as associated cognitive skills, in order to meet the specific needs of both TD- and MLD-children.

Subtypes of mathematical learning difficulties in adolescent students

Presenting Author: Johan Korhonen, Åbo Akademi University, Finland; **Co-Author:** Pekka Räsänen, Niilo Mäki Institute, Finland

While the prevalence rate of mathematical learning difficulties (MLD) is four to seven percent, it is conventional to treat students up to the twenty-fifth percentile as having difficulties in mathematics. A defining feature of MLD is number processing deficits while the etiological basis of low-achievement in mathematics is more heterogeneous (e.g., cognitive-, language-, and socio-emotional factors). This makes it challenging to compare results over different studies as different criteria and different cutoff scores have been used to define MLD. The aim of the study was to investigate subtypes of mathematical learning difficulties in a sample of adolescent students utilizing model-based clustering. Students completed measures of math performance, symbolic magnitude comparison and math anxiety twice during one school year. Latent profile analyses identified three distinct subtypes of mathematical learning difficulties (MLD group, low-achievement group, math anxiety group) and one group labelled average/higher performing students. These results emphasize the need to consider both cognitive and socio-emotional indicators alongside performance measures when studying mathematical learning difficulties.

Comorbidity of reading and mathematics learning difficulties: The working memory deficit profiles

Presenting Author: Sha Tao, Beijing Normal University, China

Learning difficulties in both reading (RD) and mathematics (MD) are common in primary school. Working memory is one of the most important cognitive skills that affected children academic performance in school. This study aimed to examine the working memory profiles related to the comorbid RD and MD. Based on two times' screening assessment and teacher's rating on a checklist, of 811 5th graders from five ordinary primary schools in Beijing, 23 were classified as children with comorbid RD and MD, and 36 were chronological age and general ability controls with normal reading and mathematics abilities. In addition, 15 were classified as children with specific reading difficulties (RD alone), 21 were classified as children with specific mathematics difficulties (MD alone). Measures for working memory capacity, short-term capacity, inhibition, updating and switching related to the language and to the numerical materials were administered individually. The results indicated that the comorbid RD and MD was related to significant deficits in short term capacity, working memory capacity, inhibition, updating and switching, irrespective of the language and numerical materials. Moreover, both broader and more severe deficits in almost all components of working memory were found for children with comorbid RD and MD.

Cognitive characteristics of children with mathematical learning disabilities: A meta-analysis

Presenting Author: Ilona Friso-van den Bos, University of Twente, Netherlands; **Co-Author:** Tijs Kleemans, Behavioural Science Institute (BSI), Radboud University, Netherlands; **Co-Author:** Evelyn Kroesbergen, Behavioural Science Institute (BSI), Radboud University, Netherlands

Children with mathematical learning disabilities (MLD) form a very heterogeneous group. Former research has pointed to several deficits that may underlie MLD. However, most of these studies used heterogeneous samples leading to general conclusions that may hold true for the group as a whole, but not for all individuals within the group. Furthermore, many studies have investigated only one or few possible deficits, which makes it difficult to compare the relative effects of these underlying factors. The current meta-analysis was conducted to (1) give a state-of-art overview of the cognitive deficits underlying MLD, (2) investigate how selection criteria influence conclusions about the cognitive deficits of children with MLD. A total of 89 studies were selected that compared a group of children with MLD with typically developing peers. The results of the meta-analysis show that children with MLD have deficits in working memory, number sense, and rapid automatized naming. For all of these outcome variables, the severity of deficits was associated with the sample selection.

Session G 5

13 August 2019 13:45 - 15:15

Lecture Hall - H08

Symposium

Teaching and Teacher Education

Promoting Reflection at the Workplace: How to Support Tomorrow's Professionals

Keywords: Case studies, Educational technology, In-service teacher education, Reflection, Video analysis, Workplace learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Dominik Petko, University of Zurich, Switzerland

Organiser: Karen Könings, Maastricht University, Netherlands

Discussant: Tina Seidel, Technische Universität München, Germany

Reflection on practical experiences has been a core component of basic training and further professional development in many disciplines. Teacher education and medical education stand out as two examples of academic professions where internships and workplace-based trainings cover large parts of the curriculum. Research in both fields have consistently shown, however, that reflection on practical experiences often remains superficial and that it is difficult to achieve the intended effect of linking theory and practice. To this end, recent projects have increasingly used technological tools to scaffold professional reflection in workplace settings. The symposium brings together four projects from medical and teacher education focusing on three promising approaches: mobile apps for professional noticing and reflection (Paper 1 and 3), video coaching (paper 2) and self-monitoring protocols (paper 4). All approaches share the idea of documenting practice to provide anchors and clues for later reflection. While the app-based approaches and the self-monitoring protocols are rather novel and therefore investigated in empirical studies, the concept of video coaching is more mature and thus presented as a review of the empirical literature. After the comments from the discussant, we will invite the audience to discuss the studies and their implications.

How peers, supervisors and patients support reflection of medical residents, but also hinder it

Presenting Author:Karen Könings, Maastricht University, Netherlands; **Co-Author:**Serge Mordang, Maastricht University, FHML, Dept. of Educational Research and Development, Netherlands; **Co-Author:**Eline Vanassche, University of East London, Cass School of Education and Communities, United Kingdom; **Co-Author:**Frank W. J. M. Smeenk, Maastricht University, Netherlands; **Co-Author:**Laurents P. S. Stassen, Maastricht University, Netherlands

Reflection on critical incidents (CI) in the workplace is crucial for learning. CI have the potential to make learners reconsider existing action repertoires and beliefs. In this study we want to better understand the reflection process at the workplace by answering the questions: why do doctors in training (residents) perceive CI as critical; how do they handle CI, and what learning behavior is elicited. This study draws on semi-structured interviews with 33 medical residents, who had different levels of reflection-support: a mobile reflection app and/or coaching sessions, or no support. Questions were open-ended, exploring how residents handle CI, aiming for 'thick descriptions' of reflection processes. Interviews were transcribed verbatim. We used a within-case and cross-case analysis to build a general pattern of explanation. Results showed reflection happens in interactions with peers, supervisors, and patients who can stimulate but also hinder reflection. Patients triggered many CI, but residents tended to seek quick solutions from peers or supervisors when patient care is top priority. A reflection app supported residents' recollection of CI and strengthened deep reflection afterwards. Coaching sessions with peer discussions enhanced deep reflection. If not involved in coaching, residents stressed the need to discuss CI further. This study shows that social interactions at the workplace trigger experiences of CI, which might be due to fear for errors or loss of face against others. Quick solutions from peers and supervisors discouraged residents' self-initiative, potentially leading to superficial reflection straightaway and limited reflection afterwards. Moreover, reflection support benefits deeper elaboration on CI.

In-Service Teacher Video Coaching: from Design to Impact – A Systematic Review

Presenting Author:Sara van der Linden, University of Twente, Netherlands; **Co-Author:**Jan van der Meij, University of Twente, Netherlands; **Co-Author:**Susan McKenney, University of Twente, Netherlands

Video coaching appears to be a promising method for in-service teacher learning. In this study, video coaching was defined as a professional development activity where coaches and teachers engage in a cycle of recording teaching episodes and a video-based discussion. This cycle is combined with at least one pre-activity or post-activity or implemented repeatedly. It offers opportunities for reflection on practice, which is widely regarded as an important vehicle for teacher change. Previous related reviews have focused on single outcomes of the use of teachers' own video recorded teaching practices for professional development. Our aim is to conduct a systematic literature review to investigate the design, processes, outcomes and impact of video coaching for in-service teachers simultaneously through a conjecture mapping approach. The findings indicate that the design can vary from fairly simple to quite complex. Where studies contain process data, the results show that attention is focused on important actors in the learning process. This process unfolds when teachers explore their teaching, when they use artifacts of practice, and when the coach provides input and support. The review shows positive teacher outcomes, such as professional vision and teacher instruction. Only a few studies reported student achievement or engagement. The results of this study contribute to understanding of how teachers' learning in the workplace can be supported through video coaching and yield implications for its design.

Reflection with Mobile Technologies: Case studies on using the Metapholio App in Teacher Education

Presenting Author:Dominik Petko, University of Zurich, Switzerland; **Co-Author:**Laura Müller, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Regina Schmid, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Michael Hielscher, Pädagogische Hochschule Schwyz, Switzerland

Mobile technologies can be considered promising tools to scaffold reflection in teaching practice, e.g. by supporting professional noticing through multimedia records, providing anchors and prompts for reflection and by opening up a hybrid space for discussion with peers and mentors. As there are no apps available that combine these functionalities and to study the interplay of these activities, a new mobile app for teacher education was developed (www.metapholio.ch). To explore the relation of usage patterns of the app and self-reported teacher self-efficacy and technology acceptance, case studies with preservice primary teachers were conducted. Nine preservice teachers and their teacher mentors used the app over a period of two months during a teaching internship. Data collection includes qualitative records of preservice teachers' notes and reflections, quantitative logfiles from the app and questionnaire data from preservice teachers with regard to teacher self-efficacy and technology acceptance at the end of the internship. Data is analyzed by means of qualitative case reports as well as descriptive and robust nonparametric statistics suitable for small samples. Especially the activities of teacher mentors seem to be important for higher levels of student activity, teacher self-efficacy as well as technology acceptance.

Modelling and Supporting Teachers' Technology-Integration with a Self-Monitoring Reflection Tool

Presenting Author:Iris Backfisch, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

In the course of digitalization, implementing educational technology in the classroom is regarded as a core practice in teaching. Teachers, however, often perceive the integration of technology as challenging and require additional assistance. One process-oriented tool to scaffold teachers' professional growth is the use of reflection protocols in which teachers reflect on critical aspects of their technology-based teaching practices. Therefore, the aim of this project is the development of an evidence-based reflection tool which supports teachers in their improvements of their technology-enhanced teaching practices. In a first step, we conducted a longitudinal study to elicit central motivational facilitators and inhibitors that constrain teachers' technology-integration. We implemented a web-based self-monitoring protocol in which teachers (N = 18) weekly described their teaching practices and reflected upon their current motivational states (i.e., self-efficacy, utility of technology), and their encountered problems during technology-enhanced teaching. Growth curve models revealed differential effects of teachers' perceived utility and their encountered problems on teaching quality. Based on these findings, in a second step, we implemented a reflection tool which stimulates teachers' self-reflection by automatic visualizations of their perceived utility and the encountered problems. We are currently running an intervention study investigating potential effects of the reflection tool on teachers' technology-integration. Together, our findings highlight the central role of motivational facilitators to enhance teachers' professional development.

Session G 6

13 August 2019 13:45 - 15:15

Lecture Hall - H11

Symposium

Motivational, Social and Affective Processes

Teachers' and parents' social role for students' well-being and emotions in school

Keywords: Emotion and affect, Motivation, Motivation and emotion, Parental involvement in learning, Quantitative methods, Secondary education, Social aspects of learning and teaching, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Tina Hascher, University of Bern, Switzerland

Chairperson: Dave Putwain, Liverpool John Moores University, United Kingdom

Discussant: Simone Volet, Murdoch University, Australia

There is strong empirical evidence about the crucial role that teachers and parents play for students' learning outcomes. As learning and achievement is demanding, both academic and social-emotional support is important for children and adolescents to reach the learning goals. During recent years, social and emotional aspects of school and learning have received growing attention and it becomes evident that high-quality education also integrates aspects beyond learning and achievement. However, less is known about teachers' and parents' impact on students' well-being and emotions in school. Thus, this symposium addresses different facets of the social impact that teachers and parents have on students' well-being and emotional experiences. Paper 1, from the United Kingdom, points to the effects that teachers' messages about the importance of avoiding failure have on student behavioural and emotional engagement. Paper 2, from the Netherlands, sheds light on dyadic teacher-student relationships and shows their importance for students' emotions during learning. Paper 3, from

Switzerland, discusses the role of teacher justice and error culture is an important determinant of alienation from school. Paper 4, from Germany, broadens the perspective by asking about the role that the home context plays for students' well-being, motivation, and emotion in school, from the perspective of self-determination theory. Together, the presentations help to gain a deeper insight into emotional processes in school; specifically, how teachers and parents can foster or hinder well-being and emotions related to learning.

Teachers may be more important for student emotions in class than we thought

Presenting Author: Tim Mainhard, Utrecht University, Netherlands; **Co-Author:** V. Sophie Oudman, Utrecht University, Department of Education, Netherlands; **Co-Author:** Lisette Hornstra, Utrecht University, Netherlands; **Co-Author:** Roel J. Bosker, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands; **Co-Author:** Thomas Goetz, University of Konstanz, Germany

This study highlights the importance of teachers for student emotions in class. First, in line with the work of Kenny, we argue that the specific, dyadic, relationship that evolves between teachers and students drives students' emotional experiences. We highlight the importance of the specific relationship by decomposing the variability in student emotions not only into the commonly investigated stable student and teacher facets but also into facets representing specific pairings of teachers with classes and students (so-called relationship effects). Second, using interpersonal theory, we assess the degree to which the interpersonal quality of teaching accounts for variability in student emotions. Cross-classified multilevel modelling of 8042 student ratings ($N=1668$ secondary school students, $M_{age}=14.94$) of 91 teachers indicated that a considerable amount of variability that is usually assigned to the student level may be due to relationship effects involving teachers. Furthermore, the way that teachers interpersonally relate to their students is highly predictive of student emotions. In sum, teachers may be even more important for student emotions than previous research has indicated.

Does warning less engaged students about likely failure make them any more engaged?

Presenting Author: Dave Putwain, Liverpool John Moores University, United Kingdom

Prior to high-stakes examinations teachers use messages that focus on the importance of avoiding failure (fear appeals). Prior studies have shown that the relations between fear appeals and student outcomes (e.g., motivation and engagement) depend on how fear appeals are appraised by students. If appraised as a challenge, fear appeals will positively relate to educational outcomes. However, if appraised as a threat, fear appeals will negatively relate to educational outcomes. Few studies have examined how fear appeals relate to emotional outcomes or the reasons why teachers might use fear appeals. In the present study we examined whether teacher use of fear appeals was related to their perceptions of student behavioural and emotional engagement, followed by students' interpretation of fear appeals, and how they related to student-reported behavioural and emotional engagement. Data were collected from 2061 participants studying for a high-stakes secondary school exit examination in mathematics and 49 teachers (male = 23, female = 26) responsible for their mathematics education over two waves. Data were analysed in a structural equation model. Teachers used more frequent fear appeals when they perceived student behavioural engagement to be low. A challenge appraisal was associated with greater, and a threat appraisal with lower, behavioural and emotional engagement. Fear appeals would therefore seem to be a high risk strategy. Teachers might use fear appeals with students who appraise them as a threat and paradoxically damage rather than enhance and subsequent behavioural.

The role of teacher justice and error culture for alienation from teachers

Presenting Author: Tina Hascher, University of Bern, Switzerland; **Co-Author:** Julia Morinaj, University of Bern, Switzerland

It was shown that students' beliefs that most teachers are fair and supportive contribute to positive school experiences and student emotions (Çağlar, 2013). On the contrary, students' perceptions of teachers and their instructional practices as unfair contribute to the development of negative attitudes and emotions toward teachers, learning, and school (Paulsel & Chory-Assad, 2005). Therefore, examining students' perceptions of teacher fairness and error culture and their possible effects on students' alienation from teachers carries valuable implications for improving student well-being and the emotional quality of classrooms. This longitudinal study explored the development of students' perception of teacher justice, error culture, and students' alienation from teachers as well as the associations between the constructs among Swiss primary ($N=406$) and secondary school ($N=401$) students over three measurement points (grades 4 to 6 and grades 7 to 9, respectively). Data were analysed by using repeated measures analysis of variance and cross-lagged panel analyses. Primary school students showed higher levels of perceived teacher justice and error culture and were less alienated from teachers. The results revealed a similar pattern of associations between students' perception of teacher justice in earlier grades and later alienation from teachers for both primary and secondary school students. In secondary school, earlier alienation from teachers negatively also predicted subsequent perception of error culture.

The Impact of the Home Learning Context on Students' Well-being, Motivation, and Emotion

Presenting Author: Barbara Otto, University of Landau, Germany; **Co-Author:** Stephanie Reuter, University of Koblenz-Landau, Department of Developmental and Educational Psychology, Germany

Students' well-being has been found to be a crucial determinant of a favorable academic development. Therefore, fostering students well-being should be a main aim in educational research. However, before developing interventions the specific determinants of students' well-being need to be further investigated. In this context, research lacks regarding examining the contextual determinants of students well-being and associated variables. Parents can be assumed to be the most relevant interaction partners of middle school students. Therefore, basing on the well-established Self-Determination Theory this study addresses the research question, which role the home context plays for middle school students' well-being, motivation, and emotion. Moreover, it aimed at investigating this prediction from two different perspectives: student report and mother report.

Session G 7

13 August 2019 13:45 - 15:15

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Teaching and Teacher Education

Understanding teachers' change trajectories and perspectives in teacher professional development

Keywords: Argumentation, Case studies, Conversation/ Discourse analysis, In-service teacher education, Mixed-method research, Social interaction, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Ann-Kathrin Schindler, Technische Universität München, Germany

Discussant: Maaïke Endedijk, University of Twente, Netherlands

Researchers claim a not yet sufficient understanding of teachers' change in teacher professional development (TPD) (Bakkenes et al., 2010). In this context, experimental effectiveness testing of TPD programs has a meaningful authority (Wayne et al., 2008) but might leave questions open when programs lack significant differences and often do not adequately show why a program worked. Currently, it is argued that we need a better understanding of individual uptakes of TPD content, teachers' learning trajectories and their perspectives on the programs (e.g. McKeown et al., 2018). The symposium contributes to this demand by presenting four international, multiple data source (e.g. video-, questionnaire- and interview-) investigations of high-standard, cross-subject TPD programs. All programs lasted for minimum a year, considered evidence on effective TPD and addressed relevant topics to teachers' daily routines such as classroom discourse. Case data analysis of Paper 1 revealed a homogeneous positive alignment of teachers' pre-intervention beliefs on the topic addressed in TPD, but their individual learning trajectories differed throughout the program. These findings are in line with the results presented in Paper 2 which could also identify a congruency of teacher beliefs and the TPD topic, but individuality in teachers' starting practice and learning trajectories. Interview analysis of Paper 3 contribute to the aspect of individual learning trajectories by showing that teachers up took aspects of the program individually. Such individual and partly conflicting experiences with professional development – as teachers saw many activities as both helpful and difficult – were also found in the context of Paper 4.

Multi-perspective case study on changing beliefs and teacher practice during a training programme

Presenting Author:Matthias Zimmermann, University of Fribourg, Switzerland; **Co-Author:**Miriam Moser, University of Fribourg, Switzerland; **Co-Author:**Anke Wischgoll, University of Fribourg, Switzerland; **Co-Author:**Kurt Reusser, University of Zurich, Switzerland; **Co-Author:**Christine Pauli, University of Fribourg, Switzerland

This paper examines the interactive relationship between beliefs and teacher practice among in-service teachers using a discussion skills intervention (including video-based coaching cycles) in the subject of history ($N=3$). First, we focus on teachers' development process regarding discussions and instruction in the course of the training. Second, we examine to what extent a possible relation exists between this process and the expressed attitudes and beliefs in the pre- and posttest. Moreover, we investigate how students perceive potential changes in the culture of discussion and in history instruction. The qualitative development analyses from the pretest and the coaching cycles of the three history teachers suggest a discrepancy between beliefs and teacher practice before the intervention, which only converges through the competences (skills and knowledge) acquired over the course of the intervention and training. Furthermore, a positive development process of the teachers can be observed with regard to leading discussions, reflected in the increasing, more multifarious use of talk moves (discussion strategies) in instruction over the duration of the training until the posttest.

Understanding teachers' learning zones and change trajectories in teacher professional development

Presenting Author:Ann-Kathrin Schindler, Technische Universität München, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:**Maralena Weil, Technical University of Munich, Germany; **Co-Author:**Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Martina Alles, Technische Universität München (TUM), Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany

Understanding implementation processes which lead to teacher change in the context of teacher professional development (TPD) is an essential, current research claim (e.g. Clarke & Hollingsworth, 2002). Besides, the relevance of addressing a certain content in TPD that is relevant to teachers' daily routines is emphasized (Lindvall et al., 2017). Therefore, the current study investigated 19 teachers who opted for high-standard TPD programs addressing classroom discourse – identified to be one of teachers' predominant daily practice challenges (e.g. Reznitskaya & Gregory, 2013). First, teachers' starting conditions regarding the change domains (personal domain, domain of practice, domain of consequence) of the interconnected model of teacher change (Clarke & Hollingsworth, 2002) were identified. Results show homogeneous positive teacher beliefs and student perceptions of classroom discourse, which were accompanied by diverse teaching practices. These findings described that teachers were already fairly convinced of the relevance of the topic, diverse in implementing it in their classrooms, and chose classes that already had positive learning perceptions. Along the Vygotskian (1978) idea, these results served as a basis for deriving teachers' individual zones of development; identifying a one-step change sequence addressing teachers' domain of practice as predominant. A mostly positive fulfillment of teachers' zones of development could be described along illustrations of teachers' change trajectories. In a last step, teachers' finishing conditions indicated the programs' power to lift teachers to a "next" teaching level and therefore contributing to TPD's task to assure for certain teaching standards.

Teachers' learning trajectory in the Lesson Study context

Presenting Author:Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Maria Vrikki, University of Cyprus, Cyprus; **Co-Author:**Paul Warwick, University of Cambridge, United Kingdom; **Co-Author:**Paul Dudley, University of Cambridge, United Kingdom

The present paper examines teachers' individual learning trajectories during their participation in a research and development project, which aimed to incorporate Lesson Study in their practice. Funded by [blinded for peer review], the project responded to the implementation of a new Mathematics Curriculum by introducing Lesson Study as a professional development model in primary and secondary schools in the [blinded for peer review]. Lesson Study involved small groups of teachers, typically within the same school, planning research lessons together and reflecting on the teaching. The project offered the opportunity to these teachers to participate in six rounds of Lesson Studies during two school years, depending on their availability. This paper follows three teachers (one primary and two secondary school teachers), who took part in most rounds of Lesson Study. The teachers participated in an in-depth, semi-structured interview at the end of the project. As stimulus for reflection during the interview, their own responses to a longitudinal survey, administered twice prior to the interview, were presented. Specifically, the teachers were asked to consider their varying survey responses as a means by which they might reflect on their learning trajectory during the project. Having audio-recorded and transcribed the interviews, a thematic analysis revealed that taking part in Lesson Study requires the development of specific professional skills. Teachers talked about what they had gained as professionals from this experience, but questioned whether there was a ceiling effect on their knowledge gains after the initial phases.

Examining teachers' perspectives on learning to facilitate argumentation

Presenting Author:Alina Reznitskaya, Montclair State University, United States; **Co-Author:**Ian A.G. Wilkinson, University of Auckland, New Zealand

In this paper, we report findings from the third yearlong iteration of a professional development program designed to help teachers conduct classroom discussions about texts to develop students' argumentation skills. The program supported teachers' facilitation of a specific type of talk called 'inquiry dialogue,' which is aimed at collectively finding the most reasonable answer to a contestable question. Twenty-six fifth-grade language arts teachers, 14 in the experimental condition (professional development) and 12 in the control condition, and their students at two U.S. sites participated. In the experimental condition, the professional development program was delivered using a combination of workshops, study groups, and coaching sessions. We collected audio recordings of all professional development activities. We also conducted a total of three focus-group interviews to learn about teachers' reactions to the program. We transcribed and analyzed study group meetings, two randomly selected coaching sessions per teacher, and the focus-group interviews. Our code-based analysis of teachers' comments revealed conflicting experiences with professional development, as teachers saw many activities as both helpful and difficult. Analysis of teachers' feedback suggested instructional strategies that might inform future professional development programs aimed at supporting teachers' facilitation of argumentation.

Session G 8

13 August 2019 13:45 - 15:15

Lecture Hall - H10

Symposium

Higher Education

Pursuing careers beyond academia: Motivations, challenges, and trajectories

Keywords: Competencies, Doctoral education, Higher education, Motivation, Researcher education, Social interaction, Workplace learning

Interest group: SIG 24 - Researcher Education and Careers

Chairperson: Isabelle Skakni, United Kingdom

Discussant: Lynn McAlpine, Canada

While the growing number of PhD holders worldwide has significantly increased the competition for tenure-track positions, postdoctoral appointments have become precarious and no longer a short-term trajectory towards an academic career. Thus, PhD holders are increasingly searching for non-academic positions, both within and outside universities. In the latter case, the labour market—whether it involves national and international science systems, governments, or private sectors—is not necessarily prepared for this growing supply of highly skilled workers. Outside of academia, PhD holders are sometimes perceived as overqualified, and many employers remain sceptical about hiring them. However, PhDs in STEM fields tends to be better valued outside academia than those in humanities and social sciences. In both cases, a PhD holder is unlikely to return to academia after leaving. Yet, PhD holders in non-academic positions, especially those who do not work in universities, remain a largely unresearched population. This symposium provides new insights into this issue by offering a rare immersion into the subjective experiences of PhD holders pursuing non-academic careers in five countries: Australia, Switzerland, England, Italy, and the Netherlands. The first paper examines PhD holders' motivations to engage in a PhD and their pathways out of academia on completing those degrees. The second paper highlights the 'culture shock' experienced by PhD holders when transitioning from academia to non-academic sectors. The third paper

explores the challenges of transferring competencies developed during the PhD into non-academic contexts, and the fourth paper focuses on the daily experiences of PhD holders in non-academic positions.

Moving on: HASS PhD graduates negotiating motivations, aspirations and employment outcomes

Presenting Author: Isabelle Skakni, Lancaster University and University of Applied Sciences and Arts Western Switzerland, United Kingdom; **Co-Author:** Cally Guerin, University of Adelaide, Australia

Despite repeated stories in the academic and popular press about the limited opportunities for academic careers available to doctoral graduates in most western countries, we continue to produce more and more PhDs. In Australia, for example, there are sufficient PhD graduates each year to replace the nation's current academic workforce in only three years (McGagh et al., 2016). Yet many doctoral candidates express a desire to become full-time tenured academics. This paper draws on the data from semi-structured interviews with 12 Australian PhD graduates from Humanities, Arts and Social Sciences (HASS) disciplines to understand more about their motivations to embark on a PhD and their pathways out of academia on completing those degrees.

The interviews revealed that all of the participants had either hoped to become academics at the time of commencing their doctoral studies, or had not thought beyond completing the degree. However, it became clear during their candidature that the realities of academic life fell far short of their idealised imaginings. Interpreting these stories through the lenses of 'life script' (Beiber & Worley, 2006) and 'cruel optimism' (Berlant, 2006), I trace their trajectories inside and beyond academia. The push factors at play in their stories were the limited job opportunities available to them, the realities of teaching in the contemporary university, and the prevailing academic cultures they found themselves in. Although they agreed it had been worthwhile doing a PhD, all were now working outside the academy.

PhD holders' transitions towards unconventional professional contexts

Presenting Author: Andrea Galimberti, University of Milano Bicocca Italy, Italy

In an "age of supercomplexity" (Barnett, 2000), educational systems continually face new questions and new ideas about the relationship with knowledge. In particular, knowledge actors, roles, and networks are constantly changing. Junior academics (e.g., postdoctoral researchers, junior lecturers, PhDs) are at the crossroad of this scenario, facing new constraints and new possibilities. Younger entry-level academics are, in fact, dealing with a lack of opportunities regarding long-term careers: it is reasonable to agree that the chances of a PhD graduate for eventually obtaining a stable position in public research are hardly higher than a few percent and slimmer when geographical constraints are set (Van der Weijden et al., 2016). This uncertainty inside academia is exacerbated by a general difficulty to find satisfying employment in the private sector (Vitae, 2010). Academic experiences can be very difficult for a potential employer to interpret, as much as it is difficult for a researcher to determine which of his/her experiences might be of interest outside his/her former context. For my contribution, I present a qualitative research based on narrative interviews that were addressed to PhD graduates who had experienced a professional transition and faced the challenge of "transferring" competences developed during the academic training into new contexts.

Non-academic careers for PhDs in the Netherlands

Presenting Author: Inge Van der Weijden, Leiden University, Netherlands; **Co-Author:** Christine Teelken, VU University Amsterdam, Netherlands

The number of PhDs awarded by Dutch universities has doubled since 2000. Of those receiving a PhD in the Netherlands, 68% will ultimately be unable to find work at a university in the Netherlands or abroad, sometimes after first holding a temporary academic position. These PhDs will go on to find work in a non-academic setting. Until recently, there has been little insight into the types of careers pursued by PhDs after receiving their degrees. We therefore held in the period 2016-2017 semi-structured interviews with 47 PhD graduates who are working outside academia in the Netherlands. The interviews demonstrate that most PhDs were mainly intrinsically motivated. It is interesting to note that while academics tend to prefer work that offers them autonomy and is intellectually stimulating, PhDs who started working in non-academic fields place a higher priority on work that has practical and social significance, as well as on connection and cooperation.

PhD holders entering non-academic sectors: A culture shock

Presenting Author: Isabelle Skakni, Lancaster University and University of Applied Sciences and Arts Western Switzerland, United Kingdom; **Co-Author:** Kelsey Inouye, University of Oxford, United Kingdom; **Co-Author:** Lynn McAlpine, University of Oxford / McGill University, Canada

This paper addresses the subjective experiences of PhD holders from Switzerland and England who are pursuing careers beyond academia. The study is theoretically situated in a psychosocial perspective and draws on the concept of culture shock (Ward, Furnham & Bochner, 2005), which broadly refers to psychological reactions to unfamiliar environments. From this perspective the passage from academia to non-academic professional sectors is understood as a psychosocial transition, which implies intra-psychological, interpersonal, and social adaptation processes (Masdonati & Zittoun, 2012). Semi-structured interviews were conducted with 15 PhD holders pursuing non-academic careers in private, government, or para-public sectors for less than ten years. The analysis shows that, when entering non-academic sectors, participants are devoting a large part of their time and energy to understanding their work environment culture, a puzzling experience that induces a process of identity deconstruction-reconstruction.

Session G 9

13 August 2019 13:45 - 15:15

Seminar Room - S02

Poster Presentation

Cognitive Science, Instructional Design

Instructional Design

Keywords: Arts, Competencies, Educational technology, Experimental studies, Instructional design, Mixed-method research, Multimedia learning, Neuroscience, Problem solving, Quasi-experimental research, Teaching/instruction

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes

Chairperson: Sindu George, Monash University, Australia

Gaze display interpretation: Can a teacher read a learner's mind?

Keywords: Educational technology, Experimental studies, Instructional design, Teaching/instruction

Presenting Author: Ellen Kok, Utrecht University, Netherlands; **Co-Author:** Margot van Wermeskerken, Erasmus Medical Center, Netherlands; **Co-Author:** Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:** Ignace Hooge, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

It is often challenging for teachers to know what difficulties learners experience while they are performing a task. Displaying where a learner is looking while performing a task (gaze display) might provide a teacher with information about what the learner understands or struggles with, making it easier for teachers to provide adaptive instruction. However, the use of gaze displays requires that teachers can meaningfully interpret them. We are currently investigating if teachers can interpret gaze displays on complex tasks, such as cognitive processing during debugging computer code. In phase 1, 15 students first executed two debugging tasks in MATLAB, while their gaze was recorded using an SMI-RED 250 Hz eye tracker, and while thinking aloud. After each task, participants rated invested mental effort and confidence. In phase 2, we will make dynamic gaze displays of their eye movements and task performance and present those to teachers, who will be asked to think aloud about what cognitive processes are reflected in the gaze displays. Students' and teachers' think-aloud protocols will be compared using scarf plots to quantify overlap, with high overlap reflecting teachers' ability to interpret gaze displays in terms of cognitive processes.

Additionally, teachers will be asked to rate the learners' invested mental effort, confidence and number of bugs solved. This study aims to contribute to the question whether gaze displays can be used to help teachers be more adaptive, by first investigating to what extent teachers can interpret gaze displays in terms of cognitive processes.

Using EEG and eye-tracking as process measures to study the effects of pictorial seductive details

Keywords: Experimental studies, Instructional design, Multimedia learning, Neuroscience

Presenting Author: Christian Scharinger, Leibniz-Institut für Wissensmedien, Germany

Pictures are often used as decorative elements in textual learning materials. Such decorative pictures (DP) may be interesting or attention capturing, yet they are not necessarily needed for the understanding of the core learning content and are thought to function as so-called seductive details. Whether and why the use of DP in learning materials results in beneficial or detrimental effects on learning outcomes is still a matter of debate. I will outline and discuss a recently started research project that aims at systematically studying the effects of DP on the learners' cognitive load, attentional focus, and motivation using the electroencephalogram (EEG) and eye-tracking as online process measures. In doing so, the research project also aims at studying the potentials of these (neuro-) physiological measures for research on instructional design. The overall project context as well as the outcomes of a pilot study will be presented.

Does perceived task appropriateness of the task for the model affect learning from video examples?

Keywords: Experimental studies, Instructional design, Multimedia learning, Quasi-experimental research

Presenting Author: Tim van Marlen, Utrecht University, Netherlands; **Co-Author:** Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Larissa den Boer, Utrecht University, Netherlands; **Co-Author:** Margot van Wermeskerken, Erasmus Medical Center, Netherlands; **Co-Author:** Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Although the use of video modeling examples, in which a model gives a task demonstration, has mushroomed in education, little is known about how to effectively design these examples. Findings show that the effectiveness of video modeling examples can depend on model characteristics (e.g., age, gender, expertise). However, recent findings contradict the model-observer similarity hypothesis and suggest that the perceived appropriateness of the task for the model is more important. We test the task-appropriateness hypothesis, stating that students would learn more from models they perceive to be better suited to explain the task. A 2(Model Age: Peer/Adult) x 2(Model Gender: Male/Female) design is used to examine whether the effectiveness of video modeling examples on how to troubleshoot a parallel electrical circuit task, depends on model characteristics (i.e., age and gender). A task-appropriateness test is administered consisting of two tasks: a forced-choice task in which students are presented with pictures depicting two persons and have to choose as fast as possible which of the two persons they would expect to be 'better able to explain a physics task'. In the second task, students rate persons (one-by-one) how well they expect the person on the picture to 'be able to explain a physics task'. We will explore whether the task-appropriateness perceptions can account for any effects of model age or gender by examining the frequency and reaction times of preferring one model type over the other. The results of this work-in-progress study will be presented at the conference.

Effects of an Instructional Approach on enhancing Pre-service Teachers' Diagnostic Competence

Keywords: Competencies, Experimental studies, Instructional design, Problem solving

Presenting Author: Venance Timothy, Ludwig-Maximilians-Universität (LMU), Tanzania, United Republic of; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Raimund Girwidz, Ludwig-Maximilians-Universität-München, Germany; **Co-Author:** Matthias Stadler, Ludwig-Maximilians-Universität-München, Germany; **Co-Author:** James Slotta, Boston College, United States

Learners may encounter cognitive load due to instructional procedures. This study investigated the effect of example-based instruction vs. problem-solving on enhancing pre-service teachers' diagnostic competence and further asked whether cognitive load would be the mediator between an instructional approach and the diagnostic competence. A controlled experiment was carried out in order to enhance pre-service teachers' diagnostic competence through an intervention. 81 undergraduate students who enrolled in a bachelor of education and majoring in Physics, were randomly assigned to problem solving experimental group (n = 26), example-based learning group (n = 28), and a control group (n = 27). Pre-service teachers' diagnostic competence was measured in terms of conceptual and procedural knowledge through an objective test, while their cognitive load was measured with a rating scale. Data were analyzed using multivariate statistics and regression analysis. Results showed that both instructional approaches had significantly enhanced pre-service teachers' conceptual diagnostic knowledge but not their procedural knowledge. The cognitive load seems to be not a significant mediator on the effect of example-based learning and problem-solving on enhancing pre-service teachers' diagnostic competence.

Uncovering experts' knowledge on improvisational expertise: The Radio Jazz Research Case.

Keywords: Arts, Competencies, Instructional design, Mixed-method research

Presenting Author: Iwan Wopereis, Open University of the Netherlands, Netherlands

This study presents a group concept mapping (GCM) study on improvisational expertise. It replicates an earlier study on this subject with the aim of validating previous results (see Wopereis, Stoyanov, Kirschner, and Van Merriënboer, 2013). Such validation is necessary because improvisation expertise is subject to change. The question is also whether experts in different countries think the same about the knowledge, skills and attitudes needed to improvise well. We invited German speaking musical experts of the Radio Jazz Research association to follow a GCM procedure. Preliminary results show thematic similarities between the current and previous study. A striking difference is the attention of the German experts for learning, (personal) growth, and experimentation in improvisational expertise, which is absent in the previous GCM study. During the poster at EARLI similarities and differences between the two concept maps will be discussed. In addition, the value of GCM for the initial phase of instruction design will be emphasized.

Session G 10

13 August 2019 13:45 - 15:15

Seminar Room - S03

Poster Presentation

Higher Education, Instructional Design, Learning and Instructional Technology

Technology-Enhanced Learning

Keywords: Comprehension of text and graphics, E-learning/ Online learning, Early childhood education, Educational technology, Engineering, Higher education, Instructional design, Learning analytics, Learning Technologies, Motivation, Qualitative methods, Self-regulation, Teaching/instruction, Technology

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 17 - Methods in Learning Research

Chairperson: Candice Guy-Gaytán, United States

Effects of guidance on learning and motivation in a remote laboratory

Keywords: E-learning/ Online learning, Higher education, Instructional design, Motivation

Presenting Author: Anja Hawlitschek, Magdeburg-Stendal University of Applied Sciences, Germany; **Co-Author:** Sebastian Zug, Otto-von-Guericke-University Magdeburg, Germany

To learn in a remote laboratory provides advantages, e.g. usage from anywhere and anytime, but also challenges. When designing the remote laboratory, one important challenge is to provide students with the right amount of instructional guidance. To investigate this further, we compared learning outcomes and motivational effects from providing basic versus enhanced guidance (in the form of prompts) for students solving programming tasks in a remote laboratory. Although it is relevant to support students in online phases without direct contact to lecturer to prevent drop-out and increase learning, our results point out that more guidance is not better in each case. Whereas we found no differences concerning learning outcome, students in the enhanced guidance group reported less intrinsic motivation and logfiles revealed lower application of programming skills. We provide two explanations for this result: On the one hand, to program a functional solution students have to generate inferences on the basis of their prior knowledge. Too much guidance in the form of prompts might narrow the

cognitive scope of students. It is possible that they rely too much on the prompts which prevents deep thinking about a problem and leads to a decreased application of programming skills. On the other hand our results might be a consequence of a specific disciplinary culture in computer science, pushing the stereotype of the brilliant geek which devotes all his time in solving programming problems. Too much guidance might be autonomy thwarting in this context. This has to be investigated in further research.

Convergence in co-design: Development and Effects of a Graphical Educational Modelling Language.

Keywords: E-learning/ Online learning, Instructional design, Qualitative methods, Technology

Presenting Author:Armin Weinberger, Saarland University, Germany; **Co-Author:**Allison Kolling, Universität des Saarlandes, Germany

To design online courses, teachers, designers, and developers share experience and expertise in co-design teams. These teams often face the challenge of expressing themselves in ways that are transferable to the experiences of the other groups. This makes converging on a course design difficult as programmers tend to need highly formalized, non-ambiguous representations and pedagogues work with rich, text-based descriptions. In order to assist in this process, we developed, applied, and analyzed the implementation of an Educational Modeling Language (EML), Co-design Graphical language (CoDe-Graph). CoDe-Graph is a tool for visualizing and communicating existing ideas, or brainstorming new ideas for course designs, in particular, for co-designing MOOCs (Massive Open Online Courses) by multidisciplinary groups. Main design criteria were flexibility, to represent nearly any learning activity, as well as simplicity, to be learned and implemented in a few minutes. CoDe-Graph was tested in numerous co-design sessions with varying cultural contexts, domains, team sizes and timeframes, to represent various types of MOOCs. Each co-design session was videotaped and analyzed building on grounded theory. Here, we will present the processes and outcomes of co-design convergence in heterogeneous groups. Initial results reveal that the graphic language was used in a similar manner in each case, despite the wide variation in contexts. Qualitative process analysis shows that different stages of the co-design process emerge, which can be traced by the graphical language. CoDe-Graph assists design teams in reaching convergence by providing a structure and vocabulary for design discussions and decisions in each stage.

How do personalized visualizations influence students self-regulated learning?

Keywords: Educational technology, Instructional design, Learning analytics, Self-regulation

Presenting Author:Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Anne Horvers, Behavioural Science Institute, Radboud University Nijmegen, Netherlands; **Co-Author:**Ryan Baker, University of Pennsylvania, United States

This contribution reports on two experimental studies that explore how data from Adaptive Learning Technologies (ALTs) can be used to support students' Self-Regulated Learning (SRL). While students learn using adaptive learning technologies on tablets, they leave rich traces of data that capture many details of their learning processes. These data are used to support students to apply SRL effectively during learning. In study A, students received a goal-setting and reflection intervention in which they set goals at the start of each lesson and were asked to reflect on these goals based on ALT progress measures after each lesson. In study B, students in the experimental condition followed the same procedure as in study A, but were also shown dashboards with personalized visualizations based on Moment-by-Moment Learning Curves. These personalized visualizations serve as reference for students to better understand how they regulate their learning during a lesson. Both goal setting and personalized visualizations are expected to support students' self-regulated learning. For study A, we found that students in the goal setting condition outperformed students in the control condition with respect to learning. Effects on students' effort and accuracy are currently analyzed as well as the data from study B. The effects of personalized visualizations derived from the data and based on moment-by-moment learning curves are expected to serve as an additional reference for students to improve their SRL. The contribution of our research is the design of two SRL interventions based on ALTs trace data.

Exploring Classroom Dynamics in a University Setting: A Multilevel Modelling Approach

Keywords: Higher education, Instructional design, Learning Technologies, Teaching/instruction

Presenting Author:Fred H. F. Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Allan H. K. Yuen, The University of Hong Kong, Hong Kong; **Co-Author:**Qiyue Li, The University of Hong Kong, Hong Kong; **Co-Author:**Edmund Y. Lam, The University of Hong Kong, Hong Kong; **Co-Author:**Vincent W. L. Tam, The University of Hong Kong, Hong Kong

As a possible means to improve learning experience, researchers and teachers have long been interested in classroom dynamics. However, few studies have examined how the structure of classroom dynamics are shaped by pedagogical approaches, social processes, and classroom environments. Synthesizing data from location tracking devices, video recording, and classroom observation, this study explored classroom dynamics within a university setting. Data were collected from 12 sessions of undergraduate or taught postgraduate classes attended by 248 students. Results from two-level regression analyses showed that within classroom, female students tended to show fewer movements ($\beta = -.25, p < .001$) while postgraduate students displayed more movements ($\beta = .18, p < .05$). Between classrooms, student movement was associated with teacher movement ($\beta = .86, p < .001$), teacher praise or encouragement ($\beta = .21, p < .05$), teacher questioning ($\beta = -.25, p < .1$), and teacher lecturing ($\beta = -.51, p < .05$); whereas student response was related to teacher movement ($\beta = .52, p < .05$). Pedagogical implications and limitations were discussed.

Automatic generation of dynamic areas of interest in eye tracking: The case of software engineering

Keywords: Comprehension of text and graphics, Engineering, Learning analytics, Technology

Presenting Author:Rebecca Reuter, OTH Regensburg, Germany; **Co-Author:**Tobias Langer, FAU Erlangen-Nürnberg, Germany; **Co-Author:**Florian Hauser, Regensburg University of Applied Sciences, Germany; **Co-Author:**Daniel Muckelbauer, Regensburg University of Applied Sciences, Germany; **Co-Author:**Andreas Gegenfurtner, University of Passau, Germany; **Co-Author:**Jürgen Mottok, Regensburg University of Applied Sciences, Germany

Allocating areas of interest (AOIs) is a time-consuming step in the evaluation of eye tracking data. Increased dynamics in the screen records in more complex experiments render interactive experiments fairly infeasible, due to the fact that their evaluation becomes too time-consuming. We contribute with a software framework for the automated retrieval of AOI data. Data about the screen contents are gathered during experiment execution. These data are used to automatically generate AOIs, thus severely reducing evaluation times. We apply our framework in the context of a study that examines how software engineering students learn the synthetic modeling language UML. The students use editor software to create models, which results in frequent changes in the recorded video material. Our novel software framework for the automated generation of AOIs, however, is not limited to this case but can be used more broadly, given that screen contents can be evaluated.

Montessori and learning in the digital age – literature and innovative materials

Keywords: Early childhood education, Educational technology, Instructional design, Technology

Presenting Author:Katinka Penert, Rudolf Steiner Schule Winterthur, Switzerland; **Co-Author:**Saskia Wedel, Alanus Hochschule, Germany

"Learning in the digital age," means accompanying children on their way to becoming capable, self-sufficient adults. They should learn to decide for themselves, which proportion of their lifetime to spend in front screens and with other activities, respectively. In addition, for the time spent with screens, they should acquire skills for their active, creative, limited, critically-reflective and technically savvy use, and abilities to avoid risks of use. In addition to the great opportunities and potential inherent in increasing digitization, research findings on risks and dangers are increasing, with prominent examples Internet Gaming Disorder. In research, politics and practice, there is much disagreement about promising approaches in this area. Ideas for mastering this challenge can be found in the works of Maria Montessori and the practice of Montessori schools and kindergartens today. Montessori materials are well suited for allowing children to go forward on a self-directed exploratory path. Pedagogical work should have the goal to create an environment in which children can develop basic skills that they later use to exploit digital opportunities and avoid or manage digital risks. In the context of a research project on "progressive education and digital skills", a systematic literature search on the subject of the acquisition of early computational thinking skills and Montessori materials is conducted to identify ideas for practice. First results reveal materials such as a simple device linking the binary logic of coding to a self-programmable musical experience. Hands-on experience of participants with the material will form part of the presentation.

13 August 2019 13:45 - 15:15

Seminar Room - S09

Poster Presentation

Cognitive Science, Motivational, Social and Affective Processes

Experimental Studies

Keywords: Assessment methods and tools, Cognitive development, Comprehension of text and graphics, Cultural diversity in school, Design based research, Experimental studies, Higher education, Metacognition, Multimedia learning, Primary education, Reading comprehension, Secondary education, Social aspects of learning and teaching

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 03 - Conceptual Change, SIG 16 - Metacognition, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 27 - Online Measures of Learning Processes

Chairperson: Laura Kerslake, University of Cambridge, United Kingdom

The effect of font size on children's reading time, comprehension and meta-comprehension

Keywords: Cognitive development, Experimental studies, Metacognition, Reading comprehension

Presenting Author:Vered Halamish, Bar-Ilan University, Israel; **Co-Author:**Yamit Balaish, Bar-Ilan University, Israel

Numerous studies in cognitive psychology suggest that difficulties are often desirable for learning. There is, however, a recent controversy on whether presenting textual materials in difficult-to-read fonts is also desirable. Up to date, little research on this matter has been conducted with children. We examined the effect of smaller-than-standard fonts, that are more difficult to read, on children's reading comprehension, reading time, and metacomprehension judgments, and whether children's age moderates these effects. Second and fifth graders read four short age-appropriate texts presented either in a standard font size for that grade or in a smaller-than-standard font, they then judged their comprehension, and completed a comprehension test. Results revealed that small fonts enhanced fifth graders' comprehension, but impaired second graders' comprehension. Therefore, a small font is a desirable difficulty for fifth graders but an undesirable difficulty for second graders. Second graders had longer reading time when reading in standard (vs. smaller) font, but fifth graders' reading time was not affected by font size. Finally, fifth graders did not appreciate the benefits of a small font, and the small font improved metacomprehension accuracy. Theoretical and practical implications will be discussed.

Take Lead of your Future: Female Pupils in Secondary Education and Impact of an Empowerment Program

Keywords: Cultural diversity in school, Experimental studies, Secondary education, Social aspects of learning and teaching

Presenting Author:Lonneke de Meijer, Erasmus University Rotterdam, Netherlands; **Co-Author:**Gabriela Koppenol-Gonzalez Marin, Erasmus University Rotterdam, Netherlands; **Co-Author:**Sabine Severiens, Erasmus University Rotterdam, Netherlands

Youth in urban and diverse areas face specific challenges, such as a relatively large proportion of children dropping out of school. Many of the children miss a supportive home environment when it comes to strengthening their school career, often due to low SES and low expectations. As a result, these children are less likely to enroll in tertiary education and have lower ambitions when it comes to work (Gregg, 2013, in Fabries et al., 2017). Strengthening the position of female youth growing up in these less advantaged environments, may be especially important as they still often face exclusion, pressure to fulfill gender-specific roles, and a glass ceiling in their working life (Grossman & Grossman, 1984; Lindsey, 2015). In the present research, we propose an empowerment program for secondary school girls, which can be considered as a means to increase the opportunities of a new generation of young women and their potential. In a pre-test post-test control group design we study 230 secondary school girls in an urban area in the western part of the Netherlands. We expect that the secondary school girls that participated in an empowerment program will develop their feelings of self-esteem and capabilities (i.e., core self-evaluations, Judge et al., 2003) more than the girls that did not participate. The results will shed more light on how to develop feelings of self-esteem and capabilities among a diverse group of adolescent girls.

Does Reading Medium Really Matter?

Keywords: Comprehension of text and graphics, Experimental studies, Higher education, Reading comprehension

Presenting Author:Shiyu Liu, Ocean University of China, China

This study examined how reading medium may affect college students' reading performance. Three experiments were conducted to examine how variables such as reading habit, text genre, and text content may impact the role of reading medium. Results showed no significant differences in participants' recall of information between reading on screen and on paper, either with biographies or with expository texts. However, participants often reading on screen tended to outperform those prone to reading on paper, but this difference was only significant with biographies rather than expository texts. Furthermore, participants tended to read faster when refutation texts were presented on screen rather than in print, and there was significant difference between genders on reading time, but not in text recall. In all, while reading medium may play a role in the reading processes, the present study did not reveal apparent impacts on text retention. This work added to our understanding about the role of reading medium and text genres, and provided important implication for text comprehension instruction.

Effect of Simultaneous/Sequential Documents Presentation on Interaction Strategies and Comprehension

Keywords: Design based research, Experimental studies, Multimedia learning, Reading comprehension

Presenting Author:Caroline Leroy, Leibniz Institut für Wissensmedien, Germany; **Co-Author:**Yvonne Kammerer, Knowledge Media Research Center, Germany; **Co-Author:**Uwe Oestermeier, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany; **Co-Author:**Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM) | Knowledge Media Research Center, Germany

In this study, students ($N = 126$) read multiple (6) documents about a socio-scientific topic presented either simultaneously or sequentially on a multi-touch-table (65"). Aiming to investigate how the presentation format may affect readers' mental representation of the documents, we tested their integrated understanding of the topic with an argumentative essay as well as their memory for sources and information provided by the texts. Contrary to our hypothesis that information integration would be supported by a simultaneous presentation, the only dependent measure affected by our manipulation was whether or not essays contained source citations, with participants in the simultaneous presentation condition being more likely to cite at least one source spontaneously. Interestingly, participants presented with the documents simultaneously agreed stronger to having compared information or grouped documents. Furthermore, the more participants in the sequential presentation condition agreed to having compared documents while reading, the more likely their essays were to contain source-citations. Moreover, reading strategies as well as interaction patterns were positively related to different dependent measures in the respective experimental conditions, and the self-reported degree of grouping documents while reading was positively related to the average length of drags. These findings nurture the assumption that participants may have compensated for any detriment of presentation format by adapting their interaction patterns, thus accounting for missing effects. Therefore, interaction data are currently being investigated in more detail using a machine-learning approach. Results will be presented at the conference.

Measuring metacognitive competences in text comprehension at secondary school

Keywords: Assessment methods and tools, Experimental studies, Metacognition, Reading comprehension

Presenting Author:Catharina Tibken, University of Würzburg, Germany; **Co-Author:**Nicole von der Linden, University of Würzburg, Germany; **Co-Author:**Sandra Schmiedeler, University of Würzburg, Germany; **Co-Author:**Wolfgang Schneider, University of Würzburg, Germany; **Co-Author:**Tobias Richter, University of Würzburg, Germany

During learning from texts, it is essential for students to monitor their comprehension to allocate more time to difficult passages. Previous studies indicate that error detection may be an appropriate paradigm to measure comprehension monitoring. We adapted this paradigm with regard to the detection of errors in the situation model as a marker of comprehension monitoring. In an ongoing study, we are examining students attending German secondary school. So far, 15 students ($M_{age} = 11.2$ years; $SD_{age} = 1.2$) read short informational texts. We created an inconsistent and a consistent version of each text that differed only in one word, leading to contradictory information in the inconsistent version. Each student read seven inconsistent and four consistent texts (randomly selected)

and, afterwards, indicated whether the text contained an inconsistency. Additionally, we compared mean reading times between consistent and inconsistent sentences. Results show that the students needed more time for inconsistent ($M = 18.73$ seconds) than for consistent sentences ($M = 10.86$ seconds). Using regression analysis for hierarchical data, the consistency of the texts influenced reading time, with longer times for inconsistent sentences (*Cohen's* $d = .30$). Students with longer overall reading times seemed to detect inconsistencies more accurately ($r = .795$; $p = .059$), even when controlling for general reading competences. Thus, the inconsistency paradigm seems to be suitable for measuring comprehension monitoring at secondary school. The inconsistency detection suggests that better monitoring competences might lead to allocating more time to difficult texts. Further data collection with more participants is in progress.

The role of strategy knowledge in Fifth graders' reading: Evidence from a guided interview protocol.

Keywords: Experimental studies, Metacognition, Primary education, Reading comprehension

Presenting Author:Julie Ayroles, University of Poitiers, France; **Co-Author:**Jean-Francois Rouet, University of Poitiers, France; **Co-Author:**Mônica Macedo-Rouet, University of Paris 8, France; **Co-Author:**Christine Ros, University of Poitiers, France; **Co-Author:**François Gouëlle, University of Poitiers, France; **Co-Author:**Anna Potocki, University of Poitiers, France

The present study looked at metacognitive strategies reported by 50 ten-year-old children and 10 post-graduate students. Using a semi-guided interview protocol and a partially blurred document as an example, participants explained how they would address eight typical functional reading tasks (e.g., identify the topic of the document). Children's reading fluency, oral comprehension and reading comprehension were also measured. The qualitative and quantitative analysis of the interview transcripts revealed significant differences between the ten-year-old children and the adults. Moreover, children's knowledge of strategies was positively correlated with reading and comprehension measures. Finally, a multiple linear regression analysis found that oral comprehension was the largest predictor of strategy knowledge. We discuss the implications of these findings for the teaching of functional reading skills.

Session G 12

13 August 2019 13:45 - 15:15

Seminar Room - S16

Poster Presentation

Instructional Design, Learning and Instructional Technology, Teaching and Teacher Education

Educational Technology

Keywords: Educational Psychology, Educational technology, Emotion and affect, Learning Technologies, Mathematics, Motivation, Quantitative methods, Technology, Vocational education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes

Chairperson: Tove Gerholm, Stockholm University, Sweden

Tracking geometry learning in the AR environment

Keywords: Educational technology, Learning Technologies, Mathematics, Quantitative methods

Presenting Author:Fang-Ying Yang, National Taiwan Normal University, Taiwan; **Co-Author:**Chia-Hui Cheng, National Taiwan Normal University, Taiwan; **Co-Author:**Kausal Kumar Bhagat, Indian Institute of Technology, Kharagpur, India; **Co-Author:**Wei-Kai Liu, National Taiwan Normal University, Taiwan; **Co-Author:**Meng-Jung Tsai, National Taiwan Normal University, Taiwan

The main purpose of the study was to explore how students in the middle school level learn 3D geometric shapes in the AR environment. A Geometry AR Application was prepared to demonstrate the characteristics of different 3D geometric shapes, including different types of regular polyhedrons, prisms, pyramids and some bodies of revolution such as cylinder and cone. There were 24 7th graders from a public middle school voluntarily participating in the study. A mobile eye tracking system (Tobii Glasses 2) was used to record the visual attention during the whole learning process. Students' learning achievement was assessed with a self-constructed achievement test. In addition to concept understanding, participants' spatial ability was measured by an existing spatial reasoning instrument. The associations between the eye movement patterns, the learning outcome and the spatial ability were then analyzed with statistical methods such as correlation, t-test and regression analyses. The preliminary result showed that students' conceptual understanding improved after the AR learning task. It was found that the correlation between students' conceptual understanding and spatial ability reduced after the AR task. The eye movement analysis showed that students spent more time reading shapes of prisms and pyramids while the simple types of regular polyhedrons took less time to learn. By regression, some significant associations between results of achievement test and eye movement measures such as total reading time, percentages of fixation duration and saccade length were found.

Teachers' Diagnostic Support System: Dealing with Individual Differences in Vocational Schools

Keywords: Educational technology, Learning Technologies, Technology, Vocational education

Presenting Author:Tobias Kaerner, University of Konstanz, Germany; **Co-Author:**Julia Isabella Warwas, University of Goettingen, Germany; **Co-Author:**Stephan Schumann, University of Constance, Germany

Dealing with individual differences in the classroom challenges vocational teachers in their daily work. These challenges even start before demanding decisions on instructional strategies and methods have to be made. In order to provide individualized or differentiated forms of instruction, teachers face the problem of assessing student's individual characteristics (learning needs and prerequisites) and situational states (learning experiences and learning progress). In order to support teachers in gathering and processing complex diagnostic information during class, we have developed a client-server based software prototype running on mobile devices: the Teachers' Diagnostic Support System (TDSS). The poster presentation delineates implications for system requirements drawn from a literature review, describes the implemented system functions, and reports first results of a usability study. As an outlook, the presentation outlines how our system may assist teachers' daily tasks of diagnosing student learning and taking appropriate instructional measures.

Academic Emotions in Virtual Reality Learning: Do Presence and Prior Knowledge Really Work?

Keywords: Educational Psychology, Educational technology, Emotion and affect, Learning Technologies

Presenting Author:Diego Oswaldo Camacho Vega, Universidad Autonoma de Baja California, Mexico; **Co-Author:**Bianca Fox, University of Wolverhampton, United Kingdom

The aim of this study is to determine variation in positive and negative academic emotions in virtual learning and the correlation of presence and prior knowledge with these emotions based on the Cognitive-Affective theory of Learning with Media. A pretest-posttest quasi-experiment was conducted to determine levels of positive and negative emotions, prior knowledge and presence. The experimental setting consisted of a presentation of virtual content for the experimental group and multimedia (video) for the control group displaying the same content. Results show significant differences between groups for Class-Related Emotions and Test subscales. Results also show that virtual reality learning has the potential to decrease both negative and positive academic emotions. These results appear to be correlated to the presence sense and prior knowledge for academic emotions in virtual reality proposed in previous studies. In conclusion, future work is vital for a better understanding of the use of virtual reality in learning environments but it is clear that presence and prior knowledge have an important role in understanding academic emotions.

The Effects of Virtual Reality Learning on Task Value and Learning Strategy

Keywords: Educational Psychology, Educational technology, Learning Technologies, Motivation

Presenting Author:Juming Jiang, Doshisha University, Japan; **Co-Author:**Ryo Ishii, Doshisha University, Japan; **Co-Author:**Ayumi Tanaka, Doshisha University, Japan

In countries that heavily rely their economic development on industry, how students perceive the importance of STEM is crucial, considering that students'

attitude toward STEM significantly affects the decision of whether they will find a job that is related to those subjects after graduation. Using Virtual Reality (VR) in education can motivate students through the realistic scenes, dynamic presence, and high interaction, which leads students to become more engaged with the task. However, some argue that students' interest will eventually fade out when using VR to learn is no longer fresh, moreover, there is evidence indicated that using traditional tools such as slide show can lead to better performance than VR. Present study verified how using VR as a tool of learning affects students' task value and the use of deep learning strategy. The results of the present study gave evidence of that VR technology can successfully enhance the scaffolding of situated learning and hence positively influence the use of VR in STEM learning.

Can we augment an expert? Enhancing professional training with sensors and augmented reality

Keywords: Educational technology, Learning Technologies, Technology, Vocational education

Presenting Author:Bibeg Limbu, Open University of the Netherlands, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Roland Klemke, Open University of the Netherlands, Netherlands; **Co-Author:**Marcus Specht, Open University of the Netherlands, Netherlands

Instructional designers argue that learning should take place within the complexity of authentic tasks, while offering the learner support. This is supported in the four component instructional design model. In this submission, we present the theoretical framework for capturing expert performance to provide feedback and guidance using sensors and AR in authentic learning context. We capture experts to address the scarcity of experts to personally train each student and to address the difficulty for the students to understand the expert. The captured expert performance is used to provide the guidance and feedback required by the framework. Our assumption states that a augmented reality and sensor based learning environment based on the framework will be capable of supporting expert like training while monitoring cognitive load.

Effect of Expert Annotations on Apprentices Gaze Patterns and Verbalisations

Keywords: Educational technology, Learning Technologies, Technology, Vocational education

Presenting Author:Alessia Eletta Coppi, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Catharine Oertel, École Polytechnique Fédérale de Lausanne, Switzerland; **Co-Author:**Pierre Dillenbourg, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Visual skills are a fundamental proficiency in many vocations. Several studies show that novices and experts differ in visual exploration and understanding of images and that cues in the form of annotations can be effective to support visual skills development. However, such studies mainly focused on white-collar professions, leaving vocational education unexplored. Additionally, most experiments made use of non profession-specific tasks. Addressing these gaps, this study focused on fashion designers to see if annotations can convey a professional way to look at images. The hypothesis is that being exposed to annotated images will make learners' gaze patterns more similar to experts'. The study involved 39 fashion design apprentices and 16 experts. In the *pre-test* all participants observed and described a set of five images depicting shirts. In the *training-phase* the experimental group first observed a set of five images including annotations and audio description and, secondly, a set of annotated images that they had to orally describe. The same is valid for the control condition, but no visual annotations were provided. In the *post-test* all participants observed and described other five images. Participants' gaze was tracked with the Tobii eyetracker. Full results of the analysis will be available by the congress date. We predict that in the post-test the experimental group will perform more similarly to the experts compared to the control group. Results will allow us to better understand how observation develops in novices within a specific profession and will help in designing learning activities for improving observation skills.

Session G 13

13 August 2019 13:45 - 15:15

Seminar Room - S10

Poster Presentation

Cognitive Science, Higher Education, Learning and Instructional Technology, Learning and Social Interaction, Teaching and Teacher Education

Science Education

Keywords: Argumentation, Collaborative Learning, Comprehension of text and graphics, Conceptual change, Developmental processes, Higher education, Knowledge creation, Metacognition, Multimedia learning, Peer interaction, Problem solving, Quantitative methods, Science education, Self-regulation, Technology

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition

Chairperson: Hedwig Gasteiger, Germany

Reflecting about science and one's own knowledge limits through explaining scientific issues

Keywords: Argumentation, Knowledge creation, Metacognition, Science education

Presenting Author:Nina Vaupotić, University of Münster, Germany; **Co-Author:**Dorothe Kienhues, University of Münster, Germany; **Co-Author:**Regina Jucks, WWU Münster, Germany

Because of scientific development, knowledge has become highly specialised, and consequently, many scientific issues are too difficult to understand if one has not been educated in the related (academic) field. People therefore have to employ different strategies to cope with the high distribution of knowledge; they have to evaluate who is a trustworthy source of information and reflect on their own knowledge and its limits. Realising the incompleteness of one's own understanding can be induced through previously unanticipated struggle to explain how something works, a phenomenon described in the work on the illusion of explanatory depth (Rozenblit & Keil, 2002). We designed an online experimental study, in which the intervention group, in contrast to the control group, provides an explanation of how science informs an everyday issue. All participants rate their own and scientists' understanding of the scientific issue, evaluate the credibility of the scientific claim, trustworthiness of scientists and report their strategies for coping with the division of cognitive labour. We expect that the realisation of the limits of one's own knowledge through explanation influences how people perceive their own understanding and scientists' understanding of the scientific issue. We also predict that awareness of one's own limits of knowledge is related to strategies for coping with the division of cognitive labour and trust in science. We discuss implications of these findings for educational practices, science communication and theory.

Meta-analysis of Learning from Hypermedia: Surprising Effects on Knowledge, Inferences, and Transfer

Keywords: Comprehension of text and graphics, Multimedia learning, Science education, Technology

Presenting Author:Jennifer Cromley, University of Illinois at Urbana-Champaign, United States; **Co-Author:**LuEttaMae Lawrence, University of Illinois at Urbana-Champaign, United States

In this paper, we present results from a meta-analysis of published articles studying STEM learning from hypermedia environments published 2005 to 2016 and coded for factual, inferential, and transfer learning outcomes. We report findings from 121 effects, 84 of which are active control and 25 are business-as-usual, derived from 38 articles. Results indicate hypermedia is significantly effective for learning when compared to traditional methods ($d = 0.43$) and significantly but less strongly effective when comparing modified versions of the environment such as changing scaffolding ($d = 0.19$). We describe trends across studies, contradictions to current research on scaffolding in hypermedia, surprising effects on dependent variables, and suggestions for areas of future research.

Development of students' epistemic beliefs profiles across secondary school

Keywords: Developmental processes, Metacognition, Quantitative methods, Science education

Presenting Author:Andrea Bernholt, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Nele Kampa, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Maria Lindfors, Umeå University, Sweden; **Co-Author:**Peter Edelsbrunner, ETH Zurich, Switzerland

Although the field of epistemic cognition is still growing, only few studies so far have dealt with the question of how epistemic beliefs of school children can be

described in a valid way, taking different learning opportunities as possibilities for developmental trajectories into account. A valuable research approach to overcome some of the methodological problems might be classifying students into homogeneous groups according to their epistemic beliefs in science. In our study, we ask 1) what kind of science-related epistemic profiles, exist across grades 5 to 12, 2) how these profiles differ with regard to learning related outcomes, and 3) how students' epistemic belief profiles change during secondary school? A longitudinal survey with two starting cohorts (grades 5 and 9) was administered to secondary school students over a period of 4 years. The results indicate that it is valuable to identify distinctive groups of students with homogenous science-related epistemic belief patterns in both cohorts. Furthermore, results show that the epistemic belief patterns differ with regard to motivational and cognitive outcomes indicating more helpful but also more diametrical patterns of beliefs with respect to science learning in school. Moreover, results of transition analyses strengthen the finding of high stability of students' beliefs. The results will be discussed with regard to learning opportunities in every-day school life as well as adaptive interventions for specific subgroups of students for a helpful development of students' beliefs about knowledge and knowing for science learning.

Fixed and faded reflection with feedback model: Which is the most effective for improving HOTS?

Keywords: Higher education, Metacognition, Science education, Self-regulation

Presenting Author:Metri Dian Insani, KU Leuven Belgium, Universitas Negeri Malang Indonesia, Indonesia; **Co-Author:**Marion Crauwels, KU LEUVEN, Belgium; **Co-Author:**Nathalie Charlier, KU LEUVEN, Belgium; **Co-Author:**Patrick Vandijck, KU LEUVEN, Belgium

Implementing activities, such as reflection and feedback, which promote self-regulated learning (SRL) might be a useful strategy in encouraging the development of students' higher-order thinking skills (HOTS) in science education at Universitas Negeri Malang, Indonesia. Therefore, this study aims to investigate whether those activities might be suitable to improve HOTS. Undergraduates (n = 315, average age = 18 years) that are enrolled in a Basic Biology course of the Science Education and Biology Education Study Programme at Universitas Negeri Malang will participate in this experimental study set up according a pre-, mid- and post-design. A mixed method design will be applied: SRL (MAI-metacognitive awareness questionnaire), learning approaches (ASSIST-questionnaire), cognitive assessments (HOTS-tests), and a self-reflection journal. The results will be disclosed by comparing the performance of a control group with three types of experimental groups: fixed (continuous) reflection, fixed reflection with feedback, and faded (graduated reduction) reflection with feedback. Findings from this study will allow us to gain more insight in whether the applied SRL-activities enhance HOTS in the various experimental groups compared to control group. The provided feedback and students' self-reflection would strengthen students' self-regulatory processes, metacognitive awareness, and induce a shift in learning approaches. We expect that the faded reflection with feedback groups will perform better than the others due to the students' gradually internalization of the self-regulatory processes. We also believe that there will be a correlation among metacognitive awareness, learning approaches, and HOTS. The design of this study will be discussed further in detail.

Interplay of individual confrontation and collaborative success on learning science conceptions

Keywords: Collaborative Learning, Conceptual change, Peer interaction, Science education

Presenting Author:Sarah Hundertmark, Leibniz University of Hannover, Germany; **Co-Author:**Julian Heeg, Leibniz University of Hannover, Germany; **Co-Author:**Sascha Schanze, Leibniz Universität Hannover, Germany

Cognitive awareness through individual and collaborative reflection processes serve as a way to foster science learning. In the context of collaboration, following factors are discussed as being substantial as well: individual involvement and guiding instruction. Within our study we link individual cognitive confrontation situations to a collaborative interaction phase to enable involvement. Both phases were supported through a guided instruction design. The study aims at giving insights into the interconnection of: a) instructional support and the individual outcome, (b) individual confrontation and collaborative outcomes, (c) success of collaboration and individual development. The analysis is built on a mixed-methods-design. Students products (N=140, grade 7-9) from individual and collaborative phase were analysed using a multi-tier coding manual. In a further step process-related effects were indicated. All in all, the results gave evidence to the presented theoretical perspectives. The instructional design proved to be helpful for both, individual and collaborative situations and demonstrated a big need of text- and pictures-based externalization tools. Furthermore, it was shown that reflecting first individually on ones' ideas served to be a basis for being involved in fruitful collaborative discussions, which was represented within the students' collaborative solutions. In some cases, we found improvements within the outcomes, when comparing students' individual and collaborative work. Nevertheless, we currently started an in-depth analysis of the conversation protocols to get more insights into the underlying processes that influence successful collaboration and conceptual development processes. Results will be present during the presentation as well.

Promoting Scientific Creative Thinking Using Two Models of Self-Regulated Learning

Keywords: Collaborative Learning, Problem solving, Science education, Self-regulation

Presenting Author:Avigail Cohen, Bar-Ilan University, Israel; **Co-Author:**Tova Michalsky, Bar-Ilan University, Israel

Creativity is identified as a significant skill required by students graduating from school systems in the 21st century. Self-Regulated Creativity (SRC) occurs when learners actively enhance their creative process by increasing the number (fluency) and variety (flexibility) of ideas, as well as creating more exceptional ones (originality). Most calls for reform in science education emphasize engaging students in collaborative learning, solving real-world scientific problems. Studies show that creative tasks conducted in collaboration have distinct advantages over those conducted individually because they allow for enhanced quality of solutions stimulated by ideas of other group members. Socially Shared Regulation of Learning (SSRL) occurs when groups collaborate as a collective to achieve mutual learning goals. The aim of the study was to examine the influence of two models of self-regulation support – SRC and SSRL, on individual and collective scientific creative thinking. Six seventh grade classes were randomly assigned into two experimental groups and one control group. All groups conducted five sessions of ill-structured scientific-technological problem-solving tasks. One experimental group received SRC prompts, and the other experimental group received SSRL prompts. The results revealed that both types of support have a significant positive effect on the collective scientific creative process, while SRC prompts also have a significant positive effect on individual scientific creativity.

Session G 14

13 August 2019 13:45 - 15:15

Seminar Room - S14

Poster Presentation

Cognitive Science, Higher Education, Learning and Instructional Technology, Learning and Social Interaction

Student Learning

Keywords: Comprehension of text and graphics, Computer-supported collaborative learning, Cooperative/collaborative learning, Educational Psychology, Higher education, Learning approaches, Learning Technologies, Lifelong learning, Reading comprehension, Secondary education, Self-efficacy, Student learning, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes

Chairperson: Paul Ginns, The University of Sydney, Australia

Does ICT Matter for Student Learning Activities in Mathematics Instruction?

Keywords: Learning Technologies, Secondary education, Student learning, Teaching/instruction

Presenting Author:Xian Cheng, University of Tübingen, Germany; **Co-Author:**Tim Fütterer, University of Tübingen, Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Recent developments in Information and Communication Technology (ICT) have improved students' access to various digital devices and techniques which may increase their opportunity to learn. Tablet, as a typical application of ICT, has a distinctive and innovative function to enhance the instruction quality by providing

students a series of appropriate course content, diagnostic assessment, and feedback that accommodate to their learning requirements. However, previous research has shown that the impacts of tablets on learning were inconsistent and most of them focused on academic achievement. Therefore, this study aims to investigate how tablets are implemented in classrooms and to examine the unique potential of the tablet on student learning activities. The present study was one of the measurement waves of a three-year longitudinal field project with a randomized controlled trial (RCT) design and a sample of 1,044 seventh-grade students from 28 secondary schools in Germany was randomly selected into the tablet (C1) or non-tablet schools (C2). Participants in C1 have used tablets for different learning purposes and were asked to reflect on their in-class tablet experiences. After controlling students' diverse learning prerequisites as covariates, the findings indicated that the students in C1 reported significantly higher on the situational interest-catch, comprehensive elaboration, and cognitive engagement. After analyzing the results of the next wave which will collect more details on how tablets are implemented in class (e.g. make a comprehensive categorization of tablet usage), it provides a better understanding of why student learning is improved (e.g. use of tablets, novelty effect).

How eye read and learn: A social network approach

Keywords: Comprehension of text and graphics, Higher education, Reading comprehension, Student learning

Presenting Author:Leen Catrysse, University of Antwerp, Belgium; **Co-Author:**Roos Van Gasse, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

Abstract

Learning from texts is one of the most essential skills in higher education. Therefore, considerable efforts have been made in educational research to better understand the learning process associated with learning from an expository text. In order to register the ongoing reading process, eye movement registration has been used to a large extent in reading research. Up to now, mostly duration measures such as first pass and second pass fixation durations are analysed in reading research to gain more insight in this ongoing process. However, not only the *duration* can inform us on cognitive processing but also the *order* in which different areas of interest (AOI) within a text are processed are of interest. Therefore, this poster offers a unique perspective on eye movement analysis in reading research by applying techniques from social network analysis. We analyzed second pass transition matrices collected from 31 students while reading an expository text. We investigated general transition patterns between areas of interest (sentences) for all students and related these patterns to students' depth of processing. Results show that different patterns emerge and that this social network approach offers a promising way to analyze eye movement data.

Student perception of learning through a pedagogical scenario in a university class in education

Keywords: Computer-supported collaborative learning, Cooperative/collaborative learning, Higher education, Student learning

Presenting Author:Celine Girardet, University of Geneva, Switzerland; **Co-Author:**Lucie Mottier Lopez, University of Geneva, Switzerland; **Co-Author:**Andrés Gomez, University of Geneva, Switzerland

The present study, conducted in a master-level university class about collaborative research, aims to investigate student perception of their learning through a pedagogical scenario which purpose was to support deep learning in integrating collaborative and individual learning tasks taking part in a continuous assessment. Specifically, this study focuses on student perception of one of these tasks: an online collaborative platform where groups of students had to discuss two research texts following a collaboration script. Results from surveys and interviews with the students indicated that the way they prepared for this virtual collaboration session impacted their perception of deep learning through the task. Preparing for the session collaboratively instead of individually tended to inhibit exchanges and debates during the session. While this practice seemed to have limited the possibility to create a space where deep learning could occur in the session, it allowed deep learning to happen beforehand, in the collaboration spaces created by the students themselves. Our presentation will discuss how student over-preparation and teacher over-scripting could affect the aims of a pedagogical scenario. Moreover, it will show how those results can help us regulate the pedagogical scenario in the future, in order to encourage sustainable learning in a university context.

The relationship between students' approaches to learning, self-efficacy and study-related burnout

Keywords: Higher education, Learning approaches, Self-efficacy, Student learning

Presenting Author:Jokke Häsä, University of Helsinki, Finland; **Co-Author:**Nina Katajavuori, University of Helsinki, Finland; **Co-Author:**Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Ilona Södervik, University of Helsinki, Finland; **Co-Author:**Telle Hailikari, University of Helsinki, Finland

University students are struggling with many challenges in their studies. They should have effective learning strategies and skills to manage with the information flow under a pressure and to become experts in their discipline. Meanwhile the students' growing mental problems are a serious concern. Students' approaches to learning have shown to have effect on studying, but their relation to students' well-being has not been fully explored. Thus, the purpose of this study is to explore the approaches to learning and self-efficacy beliefs of first-year Life Science and their relation to study-related burnout and achievement. A total of 538 first-year students from Life Sciences participated to this study. The data for this study were gathered at spring 2018 using a HowULearn –questionnaire. The results showed that students' approaches to learning, self-efficacy and study-related burnout as well as achievement correlated with each other significantly and showed the positive correlation of deep approach and study progression and better well-being, whereas surface approach correlated with lower study progression and worse well-being. Four student profiles were found: 1) Deep learners, 2) Deep but unorganised learners, 3) Dissonant learners and 4) Surface learners. The surface learners experienced more study-related burnout than the others, whereas deep learners experienced it less than other profiles. Deep learners succeeded and progressed best in their studies as surface learners succeeded and progressed the worst. The results highlight the importance of developing teaching in higher education in the direction where students could develop their learning processes towards deep approach.

Effects of a stress-management intervention on students in higher education

Keywords: Educational Psychology, Higher education, Lifelong learning, Student learning

Presenting Author:Natalie Peters, TU Dresden, Germany; **Co-Author:**Baerbel Fuerstenau, TU Dresden, Germany

In Germany – as well as all around the world – it is no secret anymore, that students in higher education feel stressed out by their workload, their performance standards and the increasing pressure put on them due to the competitiveness of the upcoming job market. To approach stress management in a healthy way, many universities have started to establish stress management interventions (SMI) for students, which have shown to be effective. Therefore, a SMI was also introduced at the TU Dresden for two reasons: To confirm the effectiveness of SMIs for students in higher education and to justify its implementation as a compulsory element of Germany's curricula. The intervention was tested using two groups – one control group and one experimental group with the treatment. Students of both groups completed a questionnaire on the two variables perceived stress and contentment with life at three points in time: Before the intervention, directly after and two weeks after the SMI. Data was analyzed by an analysis of variance (ANOVA) with repeated measurement. Results show a significant interaction effect concerning perceived stress and contentment with life. Consequently, the SMI was successful and may therefore be used as basis to develop pre-emptive SMIs and implement them as a compulsory element in higher education in Germany and elsewhere.

Session G 15

13 August 2019 13:45 - 15:15

Seminar Room - S07

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Lifelong Learning

Cognitive Development

Keywords: Assessment methods and tools, Attitudes and beliefs, Cognitive development, Conceptual change, Early childhood education, Interdisciplinary, Mathematics, Qualitative methods, Quantitative methods, Science education, Teaching approaches

Interest group: SIG 01 - Assessment and Evaluation, SIG 03 - Conceptual Change, SIG 05 - Learning and Development in Early Childhood, SIG 17 - Methods in Learning Research

Chairperson: Julia Eberle, Ruhr-Universität Bochum, Germany

The Effect of Response Styles – A Binational Study

Keywords: Assessment methods and tools, Attitudes and beliefs, Quantitative methods, Science education

Presenting Author: Nele Kampa, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Gavin Fulmer, College of Education, University of Iowa, United States; **Co-Author:** Cari Abel-Herrmann, American Association for the Advancement of Science (AAAS), Washington DC, United States; **Co-Author:** Cory Forbes, College of Arts and Science, University of Nebraska-Lincoln, United States

Domain-specific epistemic beliefs (EB) received great attention during the last decade. A widespread instrument on science EB is based on current multidimensional conceptualizations of science EB (development, justification, source, and certainty). Results of studies applying the questionnaire point to the method effect of item wording. Former studies on item wording have been limited to revealing the method effect and targeting one-dimensional constructs and did not focus on current validation theories or aimed to improve questionnaires. In our study, we will show the impact of item wording on former usages and interpretations of results and explore possible improvements and optimizations. We will administer three versions of the questionnaire to about 1000 5th grades from November to February 2019 in the US. The versions differ regarding item wording within and across dimensions. One group will answer questions on their gender, science grade, science achievement goals and learning strategies. We will apply measurement invariance analyses, multitrait-multimethod models, and introduce the covariates into the established latent method factor strategy. We will present the challenges of a binational study as well as the results the findings of the measurement invariance analyses as well as the models incorporating first the method factor and then the covariates.

The Cognitive Diagnosis Analysis of Performance in Mathematical Literacy Assessment

Keywords: Assessment methods and tools, Cognitive development, Mathematics, Quantitative methods

Presenting Author: Su-Wei Lin, National University of Tainan, Taiwan; **Co-Author:** Chia-Huang Chen, National Taichung University of Education, Taiwan; **Co-Author:** Ching-Shu Chen, Tainan University of Technology, Taiwan; **Co-Author:** Yun Hsia Pai, National Tsing Hua University, Taiwan

The purpose of this study was to explore the performance of students in the different mathematics literacy proficient levels through the model of reading and cognitive factors of items and the responses of students to the items. This study adopted the attribute hierarchy method (AHM), one of the cognitive diagnostic models, to analyze the PISA 2012 Taiwanese data. The result showed that the seven reading and cognitive factors proposed in this study could describe the characteristics of different math level students well, and further provided the information on the proximal development of students with varying levels of performance. Finally, according to the results, suggestions for the study of mathematical education were offered.

Children's Executive Function Development in a Classroom Context: Does Children's Agency Matter?

Keywords: Cognitive development, Early childhood education, Quantitative methods, Teaching approaches

Presenting Author: Janina Eberhart, University of Cambridge, United Kingdom; **Co-Author:** Hayley Gains, University of Cambridge, UK, United Kingdom; **Co-Author:** Sara Baker, Faculty of Education, United Kingdom

Children's executive function (EFs) development is important for children's school readiness (Blair, 2002), academic achievement (Blair & Razza, 2007), and adaptive behaviour in the classroom (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Researchers have identified a number of approaches (e.g. Tools of the Mind and Montessori) that enhance children's EFs (Blair & Raver, 2014; Lillard & Else-Quest, 2006). These approaches emphasise child-led activities. Whereas teacher-led activities require children to follow instructions, in child-led activities children need to set their own goals and regulate their behaviour. Hence, we hypothesize that children who spend more time in child-led activities will demonstrate more EF growth across the school year compared to children who engage in more teacher-led activities. Final results will be presented from a study of 211 children from 32 classrooms in 14 low-income UK schools across a school year. Preliminary analysis has shown that there are differences across the classrooms in the time they allocate to child-led activities. Given the hierarchical structure of the data, multilevel modelling will be used to assess the relationship between the growth of children's EF skills and classroom characteristics. Currently, there is a trend for schools to expose children to more structured learning environments with direct instruction at an increasingly early age. However, children's EF development may be impaired if they have less time to engage in child-led activities. This study aims to assess whether this is the case, and to help us better understand the relationship between EF development and child-led activities in the classroom.

Does poverty harm? Effects of parental income on early vocabulary development

Keywords: Cognitive development, Early childhood education, Interdisciplinary, Quantitative methods

Presenting Author: Claudia Karwath, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:** Manja Attig, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:** Jutta von Maurice, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:** Sabine Weinert, University of Bamberg, Germany

Living below the poverty line leads to negative effects on a wide range of outcome indicators and in different age groups. This paper focuses on the effect of poverty on early vocabulary development. We used data from the newborns' cohort of the German National Educational Panel Study (NEPS). Thereby, data from the fourth wave were analyzed, where children were about three years old. In the sample of about 1.843 families approximately 8% lived under the poverty line, defined as less than 60% of the median equalized income. For measuring vocabulary, we considered the Peabody Picture Vocabulary Test (PPVT). Our results confirm that poverty is a risk factor for vocabulary development starting at a very young age. This effect remains even when the educational level of the mother and other background variables are controlled for. For understanding poverty as a risk factor for children's development, further analyses focus on the duration of living below the poverty line, on other relevant variables such as the activities within the household as well as on various subgroups.

Technology based assessment of phonological awareness for kindergarteners

Keywords: Assessment methods and tools, Cognitive development, Early childhood education, Qualitative methods

Presenting Author: Renáta Kiss, MTA-SZTE Research Group on the Development of Competencies, Hungary; **Co-Author:** Dóra Mokri, University of Szeged Faculty of Science and Informatics, Hungary

Among the linguistic skills, phonological awareness plays a crucial part in developing early reading skills. The predictive power of phonological awareness measured at preschool age during kindergarten years is determining (Phillips, Gormley, & Anderson, 2016). With the increase of the numbers of studies revealing the significance of phonological awareness the number of instruments examining that area is increasing too. The assessment tools becoming more child friendly and objective, adapting to the 21st century needs and taking advantage of the innovative opportunities offered by the 2th century. The survey methods of phonological awareness have been limited on face-to-face, live voice delivery, the technology-based examination of the phonological awareness of preschoolers is negligible. The study aims to examine some subskills of phonological awareness through online tests, take the advantage of the opportunities and meet the challenges of online examinations, as well as it focuses on the description of the online testing. First data shows that (1) the test is a reliable assessment tool of kindergarteners phonological awareness skills, (2) the tasks are separated along the given operational components independently from the size of the language element, and (3) the media effect was inconsiderable between the tasks and the phonological test items.

A Framework for the Statistical Modeling of Conceptual Change in Science

Keywords: Assessment methods and tools, Cognitive development, Conceptual change, Quantitative methods

Presenting Author: Peter Edelsbrunner, ETH Zurich, Switzerland

Conceptual change researchers often want to know (1) how concepts look like in a specific domain, (2) whether conceptual change takes place and how this looks like (occurrence & characterization), and (3) how this can be supported by educational interventions. In the present research, it is argued that common statistical models such as analysis of variance do in many cases provide very limited information about these three aspects of conceptual change. It is argued that two types of assessments tasks exist, which bare on the adequacy of different statistical models: Those in which within-task relational knowledge (i.e., knowledge about concepts) captures information about the respondent's concept, and those in which between-task relational knowledge captures such information. For tasks bearing on within-task relational knowledge, learners' answers to single tasks inform about the underlying concepts they hold about a topic. For tasks bearing on between-task relational knowledge, learners' answer patterns across various tasks inform about the underlying concepts they hold. It is argued that models such as analysis of variance should only be applied to data from tasks capturing within-task relational knowledge. For tasks requiring

between-task relational knowledge, statistical methods such as mixture modeling, network modeling, or factor analysis are required in order to yield maximum information about the questions of the structure, development, and educational support of concepts. Based on these assumptions, a framework is being developed that should help researchers in choosing a statistical model that can yield maximum information about the information they are interested in.

Session G 16

13 August 2019 13:45 - 15:15

Seminar Room - S01

Poster Presentation

Culture, Morality, Religion and Education, Teaching and Teacher Education

Teaching and Instruction

Keywords: Case studies, Collaborative Learning, Competencies, Cooperative/collaborative learning, Cultural diversity in school, Learning Technologies, Out-of-school learning, Primary education, Problem-based learning, Qualitative methods, Researcher education, Social aspects of learning and teaching, Special education, Teacher professional development, Teaching approaches, Teaching/instruction, Technology, Vocational education, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Ann Dowker, University of Oxford, United Kingdom

Student heterogeneity in vocational schools from the perspective of teachers

Keywords: Cultural diversity in school, Qualitative methods, Teaching/instruction, Vocational education

Presenting Author: Julian Klaus, Otto-Friedrich-University of Bamberg, Germany

Heterogeneity among pupils poses as a challenge for teachers in the German education system. Due to social, political and vocational school-related development, teachers at vocational schools in particular, as actors at the micro level, are confronted with a strongly pronounced diversity. There is no uniform definition of heterogeneity. Heterogeneity, diversity and variety are often equated. The characteristics that create heterogeneity are often associated with educational success, which makes it necessary to deal with them adequately. The proposed paper examines what vocational school teachers understand by heterogeneity, how they perceive it and how it is dealt with in teaching practice. To answer this question, 29 semi-structured interviews were conducted with VET teachers from Bavaria, Germany. The interviews were evaluated using qualitative content analysis (Mayring 2014). The results show that prior-ringing individual learning potentials in the sense of Helmke (2012), which are closely related to performance, are perceived as creating heterogeneity. When planning and carrying out the lessons, the interviewees take into account the composition of the pupils. However, some teachers only perceive heterogeneity as an opportunity. The results will be discussed with regard to the initial and continuing training of the VET teachers.

The challenge of valuing diversity: individual feedback situations in inclusive settings

Keywords: Case studies, Primary education, Social aspects of learning and teaching, Teaching/instruction

Presenting Author: Amelie Hirsch, University of Education Freiburg, Germany; **Co-Author:** Saskia Opalinski, University of Potsdam, Germany

Inclusion in education is a principle that concerns all students. Valuing the diversity of all students is a key aspect of inclusion, which influences the interaction between teachers and students e.g., in feedback situations, and can be described as active and positive attention. Further research has shown that the design of these feedback situations has a significant influence on the self-concept, the learning motivation and the learning success of students. Inclusive teaching requires teachers to encourage students in their individual learning process and avoid comparative assessments as well as social references in classroom. However, the relationship between different classroom situations and the design of feedback situations has not yet been investigated. The poster focuses on the specific challenges of feedback situations in inclusive settings for teachers. Qualitative case analyses of observation protocols (n = 187) revealed central areas of tensions (e.g., discrimination – consideration). Furthermore, the results show that valuing diversity in inclusive settings is a challenging task for teachers, who only succeed proportionally depending on the context.

Are teachers ready for effective cooperation at university museum: projects at Lomonosov MSU

Keywords: Out-of-school learning, Problem-based learning, Researcher education, Teaching approaches

Presenting Author: Marina Pikulenko, Lomonosov Moscow State University, Russian Federation; **Co-Author:** Lyudmila Popova, Lomonosov Moscow State University, Russian Federation

According to new educational standards in Russia, the teacher's professional activity is based on the application of modern educational resources which are provided by museums as well. The aim of this research work is to single out the main criteria of effective cooperation between the teachers and the staff of the Museum in the implementation of the educational projects. There has been conducted a research based on the example of the Museum of Earth Science of Lomonosov Moscow State University. More than 300 geography and ecology teachers in Moscow participated in the educational programs held between the years 2013 and 2017. We have studied the active participation of teachers and learners in the following projects: "Lessons in the Museum", "University Saturdays", Moscow Secondary School Contest "Museums. Parks. Estates". The results of the study unraveled the criteria of effective implementation of the educational programs in the museum. These are: the ability of a secondary school teacher to prepare the learners for their visit to the Museum and the capability to independently develop the lesson plans based on the Museum's expositions.

Using Technology to Teach Writing: Planning of a Systematic Review and Meta-analysis

Keywords: Learning Technologies, Teaching/instruction, Technology, Writing/Literacy

Presenting Author: Andreia Nunes, University of Porto, Portugal; **Co-Author:** Teresa Limpo, University of Porto, Portugal; **Co-Author:** São Luís Castro, University of Porto, Portugal

Achieving expertise in writing is required to access high-valued jobs and foster personal development. However, most students fail to achieve proficiency in writing. The use of Information and Communication Technology (ICT) to implement evidence-based writing practices seems of great potential for teaching writing. Unfortunately, little is known about the use of ICT on writing instruction, and how it affects students' outcomes. We aim to develop a systematic review and a meta-analysis focusing on the use of ICT on writing instruction. The goal is to understand how ICT has been used in writing instruction by teachers and researchers, and how the students' learning process is influenced by ICT. Even though we are currently starting this review, in our poster session we will be able to provide a comprehensive view on the procedure that we adopted in the systematic review and meta-analysis, along with preliminary findings. The results of this study will expand knowledge about the use of ICT in classrooms, and its effectiveness for students, as well as support the planning of a subsequent study characterizing the use of ICT in Portuguese classrooms.

Pre-service Primary School Teachers' Preparation for Team-Teaching in Inclusive Schools

Keywords: Cooperative/collaborative learning, Primary education, Special education, Teacher professional development

Presenting Author: Fabian Hoya, Paderborn University, Germany; **Co-Author:** Marwin Felix Löper, Paderborn University, Germany; **Co-Author:** Jan R. Schulze, Paderborn University, Germany; **Co-Author:** Theresa Mester, Paderborn University, Germany; **Co-Author:** Alexander Kirsch, Paderborn University, Germany; **Co-Author:** Eva Blumberg, University of Paderborn, Germany; **Co-Author:** Susanne Schwab, University of Vienna, Austria; **Co-Author:** Frank Hellmich, Paderborn University, Germany

With the ratification of the United Nations Convention on the Rights of People with Disabilities, there are numerous questions concerning the implementation of inclusive education in primary schools. One important question concerns the enhancement of pre-service teachers' competencies for inclusive learning processes in schools. In particular, the cooperation of primary school teachers and special needs teachers is regarded as an important prerequisite for children's successful learning processes. Currently, it is not yet fully clear how pre-service teachers can be prepared for team-teaching in inclusive classrooms. In our study, we therefore investigate possibilities of pre-service teachers' cooperative learning processes concerning their qualifications for inclusive science

education in primary school. In detail, we investigate whether cooperative learning processes of pre-service primary school teachers and pre-service special needs teachers lead to changes in their attitudes towards teamwork, their willingness to cooperate in inclusive education as well as their self-efficacy beliefs. In our project, pre-service primary school teachers and pre-service special needs teachers will plan together science learning lessons. Subsequently, one pre-service primary school teacher and one pre-service special needs teacher will teach a small group of children in primary school. In addition to this experimental group, two control groups will participate in our study. The one control group only consists of pre-service primary school teachers. The other control group will only include pre-service special needs teachers. The results of our study will give indications for effects of collaborative learning practices of pre-service primary school teachers and pre-service special needs teachers.

Vocational education teachers' perceptions of pedagogical practices applying collaborative learning

Keywords: Collaborative Learning, Competencies, Teacher professional development, Vocational education

Presenting Author:Anni Silvola, University of Oulu, Finland; **Co-Author:**Piia Naykki, University of Oulu, Finland; **Co-Author:**Hanni Muukkonen, University of Oulu, Finland

Fast development of society in 21st century is changing the dynamics of working life and also challenging educational institutions for the concurrent changes. Currently, vocational education is emphasizing a development of generic skills, particularly collaboration skills. Previous research has evidenced that there is a large variation on how skillful teachers are in implementing pedagogical practices to support collaboration, and how teachers perceive collaboration is one of the variable affecting how eagerly they are taking it in use in their teaching. The aim of this study is to explore how vocational education teachers perceive collaborative learning skills and how they describe their pedagogical practices regarding collaborative learning. The participants of the study are nine vocational education teachers and 56 vocational education students from three fields, namely: Social and Health services, Construction, and Business and Administration. The data was collected with semi-structured individual (teachers) and group interviews (students). The results indicate that teachers' perceptions of collaborative learning varied from detailed understanding and application of pedagogical practices supporting the development of collaborative learning skills to emphasizing a positive attitude towards student collaboration. This study contributes particularly on understanding, what kind of competencies teachers have to apply and assess collaborative learning, and to understand better field-specific characteristics of collaborative learning skills in vocational education. The importance of developing pedagogical practices for supporting collaboration skill development in vocational education are discussed.

Session G 17

13 August 2019 13:45 - 15:15

Seminar Room - S04

Poster Presentation

Motivational, Social and Affective Processes, Teaching and Teacher Education

Teaching and Instruction

Keywords: Early childhood education, Educational Psychology, Higher education, Inquiry learning, Instructional design, Mixed-method research, Motivation, Phenomenography, Pre-service teacher education, Primary education, Quantitative methods, Reading comprehension, Teaching approaches, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Dagmar Festner, University of Paderborn, Germany

Pupils' fixed mindsets: Influences of teachers' fixed-ability practices and beliefs

Keywords: Educational Psychology, Motivation, Quantitative methods, Teaching/instruction

Presenting Author:Pia Kreijkes, University of Cambridge, United Kingdom; **Co-Author:**Ros McLellan, Cambridge University, United Kingdom

The importance of pupils' mindsets for their achievement has been largely established but relatively little is known about how these beliefs develop. The goal of the current study was to understand how teaching practices influence the development of pupils' mindsets and what beliefs underlie teachers' use of practices that are likely to foster fixed mindsets, termed fixed-ability practices (FAPs). Moreover, it examined the role of relevant achievement-related beliefs, specifically goal orientation, achievement attribution, and perceived ability in these relationships. Participants were 927 pupils (aged 11-12) from 37 classes and their maths teachers (N=31) from seven secondary schools in England. They completed self-report measures of mindset and achievement-related beliefs for maths at the beginning and a newly developed questionnaire assessing FAPs towards the middle of the school year. Pupils again completed the mindset and beliefs questionnaire at the end of the school year. Data analysis is ongoing and results will be presented at the conference. Multilevel structural equation modeling will show whether teachers' mindsets predict their use of FAPs in maths and whether this is mediated by teachers' achievement-related beliefs. Moreover, it will demonstrate whether FAPs predict pupils' mindsets and whether this is mediated by pupils' achievement-related beliefs. This is the first study that examines the proposed relationships simultaneously and longitudinally, using both teacher- and pupil-reports of teaching practices. Results will help teachers and other stakeholders to understand how to communicate growth rather than fixed mindset messages to pupils.

Coherence in teacher education – A conceptual analysis and clarification of a comprehensive term

Keywords: Educational Psychology, Higher education, Pre-service teacher education, Teaching/instruction

Presenting Author:Uta Wagener-Praed, University of Oldenburg, Germany; **Co-Author:**Juliane Schlesier, University of Oldenburg, Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

In this conceptual paper we aim to offer a clarification of the construct "coherence" based on literature on coherence in education, in particular, teacher education. Coherence is a term widely used, quite broad in its meanings, and sometimes ambiguous in its connotations. Achieving coherence in general education has been a major topic in discussions of educational reforms for about two centuries. The term coherence is used to analyze and improve aspects of educational programs and this will be discussed with a focus on teacher education to add further insight for the discussion and for the symposium. The questions we are going to address are: (1) How is the term coherence defined in education and, in particular, teacher education? (2) How is coherence operationalized? (3) What are the differences and similarities of the different approaches? As coherence is regarded as a major aspect of the quality of a teacher training program, a clear understanding of what this construct entails is essential for improving education.

Teaching and Learning in Freedom-Based Learning Environments: A Systematic Review

Keywords: Inquiry learning, Instructional design, Teaching approaches, Teaching/instruction

Presenting Author:Dennis Hauk, Friedrich-Schiller-University of Jena, Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany

The design of the learning environment is a crucial condition for student learning and motivation. Therefore, evidence is needed about the effect of learning environments especially when the condition of student participation in the classroom is at the scope. This systematic empirical review contributes to the question, how effective reform-based approaches of learning and instruction are in providing learners with the right to design the learning environment (called "freedom-based learning environment", FREBLE). In total, $N = 117$ empirical studies of the last twenty years were collected of which 9 met the evidence-driven selection criteria for within-study analysis. Overall, studies show heterogeneous results regarding the effects sizes in different dimensions of FREBLE. Positive effects on student learning and motivation could be found in cases, when students have the freedom to choose their own workplace, learning time, topic and task(s). In contrast, freedoms with regard to methodical aspects (e.g. an own design of an experiment) resulted in negative consequences.

Design a professional program for preservice kindergarten teachers learning how to teach mathematics

Keywords: Early childhood education, Mixed-method research, Pre-service teacher education, Teaching/instruction

Presenting Author:Ching-Shu Chen, Tainan University of Technology, Taiwan; **Co-Author:**Su-Wei Lin, National University of Tainan, Taiwan; **Co-Author:**Chia-Huang Chen, National Taichung University of Education, Taiwan; **Co-Author:**Yun Hsia Pai, National Tsing Hua University, Taiwan

This study introduced a professional training program to preservice kindergarten teachers in order to promote their mathematics knowledge and pedagogy through collaboration and reflection. This study also investigated how the perceptions of teachers regarding the teaching and learning of mathematics were affected by their experiences in the program. The result indicated that the program was effective to promote the subjects' mathematics knowledge and pedagogy of mathematics as well as. In addition, they were also aware of studying more childhood mathematics knowledge was necessary to help young children learning mathematics. Implications for further research and teacher education are discussed based on the findings.

Teacher educators' conceptions of modeling: a phenomenographic study.

Keywords: Phenomenography, Pre-service teacher education, Teaching approaches, Teaching/instruction

Presenting Author:Helena Montenegro, Pontificia Universidad Católica de Chile, Chile

This study reports a phenomenographic research which aimed to explore the conceptions of modeling held by primary teacher educators. Data were collected through semi-structured interviews conducted face-to-face with twenty-four teacher educators working in three Chilean primary initial teacher education programs. Four categories of description were identified: modeling as a medium for: (A) sharing good teaching activities that can be replicated in the school classroom; (B) highlighting the pedagogical interactions that should be established with students; (C) providing a concrete experience of school teaching in practice; and (D) unpacking the challenge in adopting a congruent teaching approach. Besides, four dimensions of variations were found between the categories of description: (1) pedagogical activities; (2) focus; (3) situated context; and (4) potential impact. These findings have implications for both practice and research. We recommend continuing the study on this topic for improving the teaching practices enacted by teacher educators.

How students make sense about what they read: An analysis of Portuguese textbooks

Keywords: Educational Psychology, Primary education, Reading comprehension, Teaching/instruction

Presenting Author:Carolina Cordeiro, University of Porto, Portugal

Reading comprehension (RC) is an important curricular component of many subjects throughout basic education. However, despite its importance, many children and adolescents fail to reach functional levels of RC. Notwithstanding the positive progress of RC skills across recent years, Portuguese students still demonstrating great difficulties in reading and in understanding what they read. Given these results, it is important to understand how RC is addressed in students' textbooks. In this study, we examined how RC is targeted in Portuguese-Language textbooks in Grades 4 and 6. These grades correspond to the end of first and second cycles of the basic education in Portugal, respectively. Preliminary results showed that there is a higher focus on orality than on RC skills in Grade 4, but there is more balanced focus on the literacy-related skills targeted in Grade 6. Also, for both Grades, most of the questions related to RC involve short open questions, in which students are asked to provide a brief response (e.g., identify author's intentions). Nonetheless, students are provided with little guidance on how to respond to these questions. When guidance is present, students are mainly encouraged to respond by selecting information. Results also showed that, despite the importance of text structure in RC, textbooks barely used questions focused on it and, more problematic, provided little if any information on the structural characteristics of different genres. These findings signal the importance of adopting new strategies to promote RC skills among Portuguese.

Session G 18

13 August 2019 13:45 - 15:15

Seminar Room - S13

Poster Presentation

Cognitive Science, Educational Policy and Systems, Learning and Special Education, Lifelong Learning, Motivational, Social and Affective Processes

Student Learning and Researcher Education

Keywords: Achievement, At-risk students, Case studies, Competencies, Comprehension of text and graphics, Educational attainment, Educational policy, Educational Psychology, Emotion and affect, Knowledge creation, Lifelong learning, Meta-analysis, Metacognition, Motivation, Researcher education, Science education, Secondary education, Student learning, Survey Research, Vocational education

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 09 - Phenomenography and Variation Theory, SIG 15 - Special Educational Needs, SIG 18 - Educational Effectiveness, SIG 24 - Researcher Education and Careers, SIG 25 - Educational Theory

Chairperson: Lidewij van Katwijk, Netherlands

What should we learn at school? An analysis of student learning interests in disadvantaged contexts

Keywords: At-risk students, Motivation, Secondary education, Survey Research

Presenting Author:Daniel Araneda, Pontificia Universidad Católica de Chile, Chile

From the turn of the 20th Century, it is highlighted the importance of acknowledging student interests in their school work. Such a vision is in direct conflict with a trend towards homogenization found in national curricula, with an emphasis on so-called *powerful knowledge*, mainly associated with science and mathematics. Students from vulnerable contexts are the most affected. As a school code, if the curriculum is a selection of knowledge made by controlling groups, then students who are distanced from this code learn more about social hierarchy at school than about the knowledge itself. The aim of this study is to find out the kind of education that students in disadvantaged contexts want. 138 students from six under-performing schools were chosen from across Santiago de Chile (four medium-low socioeconomic status and two high socioeconomic status schools). Our results suggest that school education is largely meaningless for students from vulnerable backgrounds as it fails to take into account their likes and interests, while also failing to grant them access to higher education. This study helps identify and acknowledge the learning interests of students in disadvantaged contexts, as well as seeing how much these interests differ from those that underpin the national curriculum.

When microgenetics meets enactivism: knowledge transformation among apprentice psychotherapists

Keywords: Case studies, Knowledge creation, Student learning, Vocational education

Presenting Author:Gilles Dieumegard, Université de Montpellier, France

Microgenetic learning analyses have been developed in a cognitive perspective, they allow retracing knowledge transformation; but they necessitate an important body of prior research for identifying "knowledge-in-piece" elements. A microgenetic approach in a phenomenal / enactivist perspective could offer other possibilities. We crafted such an approach in the context of a vocational training program for psychotherapist. Our method meets the three criterions defining a microgenetic approach: focusing on a period of rapidly changing competence / high density of observation / intensive data analysis. For five monthly seminars, we conducted in depth interviews during which three participants explicitated their experience during the different moments of each seminar. These data led us to identify units of activity and significant "distinctions" for describing the transformations of knowledge for these participants. The training program led participants to experience a multiplicity of different distinctions; a lot were about participants themselves. However, these distinctions were structured by a limited number of personal themes related to each participant's course of life. At this point of our research, we wonder if these findings come from the domain and the pedagogy of the training program we study, or from the framework we endorse. The study of knowledge transformation in the second part of the training program, during which structuring concept will be taught, could give us an answer.

The effectiveness of grade retention: A systematic review

Keywords: At-risk students, Educational policy, Meta-analysis, Student learning

Presenting Author:Joana Pipa, ISPA - Instituto Universitário / CIE-ISPA (Research Center in Education), Portugal; **Co-Author:**Mieke Goos, UCLL, Belgium;

Co-Author:Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal

Research on the effectiveness of grade retention in primary and secondary education has tremendously improved during the last decade, in terms of diversity of outcomes and countries investigated and methodology used. Yet, most recent meta-analyses and systematic reviews (i.e., Allen et al., 2009; Xia & Kirby, 2009) do not mirror these improvements, in that they mainly focus on the academic achievement of repeaters in the United States, often based on methodologically

flawed studies. This makes it hard to draw sound conclusions about the effectiveness of this practice. In this systematic review, we review 90 studies that estimate effects of grade retention on repeaters' academic achievement, psychosocial functioning, school career, and job career, as well as on their peers' academic achievement, published between 2000 and 2018, in English, German, French, Spanish, Portuguese, or Dutch. All studies control for differences between retained and promoted students in the methodologically soundest way possible. Overall, our findings indicate that repeaters benefit less from their retention year than generally believed by educators, especially in terms of academic achievement and school career in the longer run. Suggestions for educational research, practice and policy will be discussed.

Researching with enthusiasm? A study on achievement emotions, predictors and effects on achievement

Keywords: Achievement, Emotion and affect, Lifelong learning, Researcher education

Presenting Author:Julia S. Meuleners, LMU Munich, Germany; **Co-Author:**Julia Eberle, Ruhr-Universität Bochum, Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany

Research is an emotional profession – but does doing research always involve enthusiasm? In line with the Control-Value Theory (CVT), achievement emotions are influenced by the support of autonomy and competence. However, also social relatedness is relevant for the explanation of the emotional state of researchers. Consequently, the combination of CVT with Self-Determination Theory, which includes these constructs as the three basic psychological needs, seems reasonable. In this study, the correlation of supportive working conditions and achievement emotions and, eventually, for a researcher's scientific productivity are investigated. A cross sectional survey on $N = 393$ post-doctoral life scientists was conducted. The results of the online-survey provide first indications that support of autonomy and competence as well as social relatedness are connected to the positive emotion enjoyment whereas the three basic needs are negatively related to negative emotions (anger, frustration and boredom). Eventually, enjoyment as a positive achievement emotion is positively and frustration as a negative achievement emotion is negatively related to the scientific productivity. Consequently, supporting the basic needs and the emotional state should be considered more in academia.

The Effect of Low Academic Performance on Students' Well-Being

Keywords: Achievement, At-risk students, Competencies, Educational attainment

Presenting Author:Linda Salihu, University of Prishtina, Kosovo

The state of being well, defined as the balance between an individual's resource pool and the challenges faced (Dodge, Daly, Huyton, & Sanders, 2012), has been found to be of critical importance for doing well in school and beyond for all students (World Bank, 2018). However, for those students who struggle with learning and experience years of repeated failures in school performance, this condition is amplified. Indeed, persistent low academic performance and learning difficulties are considered school risk factors for students' overall subjective well-being (Salihu, Aro, & Räsänen., 2017; Cooper & Jacobs, 2011). Despite the fact that students with learning difficulties may represent one of the most vulnerable groups in terms of achieving and maintaining a reasonable level of well-being, there is a lack of research studies which have included these students and provided a particular data related to them. The purpose of the study, therefore, was to examine the effect of students' performance on their well-being. A special focus of the study was on investigation of the relationship between academic performance and well-being of students with learning difficulties and their peers without learning difficulties in reading and mathematics. In this study only the data for reading performance of students is reported.

Students' questions about science texts: the influence of the title

Keywords: Comprehension of text and graphics, Educational Psychology, Metacognition, Science education

Presenting Author:Piedade Vaz-Rebelo, University of Coimbra, Portugal; **Co-Author:**Maria Morgado, High School of Tomar, Portugal; **Co-Author:**Catarina Costa, University of Coimbra, Portugal; **Co-Author:**Carlos Rebelo, University of Coimbra, Portugal; **Co-Author:**Graça Bidarra, University of Coimbra, Portugal; **Co-Author:**Carlos Barreira, University of Coimbra, Portugal

The present study aims to analyse the influence of the text title on comprehension processes, analysing students' questions about science texts with titles formulated in the affirmative form or in the interrogative form. Participants were 98 students from the 7th year of a secondary school in the central region of Portugal that read four texts on the topic of planets of the solar system. Each text had three versions, each with a specific type of title: an affirmative statement, a question of causal antecedence and a question of causal consequence. Results pointed to the influence of the title on questioning, as more questions about entities were asked when the title was a affirmative statements, while in the conditions of antecedence and causal consequences were asked more questions of these types.

Session G 19

13 August 2019 13:45 - 15:15

Seminar Room - S11

Poster Presentation

Educational Policy and Systems, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Qualitative Methods

Keywords: Attitudes and beliefs, Cognitive development, Cultural diversity in school, Educational policy, Higher education, Lifelong learning, Multicultural education, Qualitative methods, Secondary education, Teacher Effectiveness, Teacher professional development, Technology, Video analysis

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 20 - Inquiry Learning, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Sarah-Larissa Hecker, Universität Bielefeld, Germany

Conceptualizing teaching expertise in higher education: A systematic review of frameworks

Keywords: Higher education, Lifelong learning, Qualitative methods, Teacher professional development

Presenting Author:Esther van Dijk, Universiteit Utrecht / Hogeschool Utrecht, Netherlands

Due to societal developments (e.g. accountability pressure and increasing student numbers) as well as international and institutional ambitions to improve educational quality, teaching has become more important within higher education institutes. Consequentially, higher education institutes are in need of a conceptualization of teacher expertise and expertise development, so they can reward teaching achievements and support teachers' professional development. In our research we aim to provide such a conceptualization from a task-based perspective on expertise. Within this perspective, teaching expertise is determined by teachers' performance on professional tasks, which means that teacher expertise can be conceptualized by determining teaching tasks as well as how teachers develop themselves in these tasks. Following this line of reasoning, we performed a systematic review of 44 teaching and career frameworks for higher education, originating from both research and policy contexts, to conceptualize teaching expertise in this educational sector. We identified seven task domains (i.e. groups of teaching tasks): teaching delivery, student assessment, educational design, reflection and self-development, leadership, educational research and coaching. Additionally, we found three ways in which frameworks conceptualized teachers' expertise development: as better performance on a task, as the ability to perform multiple tasks and as performing tasks with a larger sphere of impact. With this study, we expand our understanding of teacher expertise in higher education, which future studies can build upon. Additionally, our findings can be used to guide professional development of higher education teachers, both at an institutional and an individual level.

Implementation of dialogic teaching with comparison of the primary and secondary schools

Keywords: Cognitive development, Qualitative methods, Teacher professional development, Video analysis

Presenting Author:Jitka Plischke, Palacky University in Olomouc, Czech Republic; **Co-Author:**Jitka NÁBĚLKOVÁ, Palacky University, Czech Republic; **Co-Author:**Danping Peng, Faculty of Education, Palacky University, Czech Republic

The paper focuses on pedagogical communication in the classroom, namely the category of dialogic teaching, in schools in the Czech Republic. Under the term

dialogic teaching, we understand an approach that seeks to cognitive and communicative activation of the pupils (Alexander, 2006; Šalamounová, Šedřová, Sedláček & Švaříček, 2017). We perceive the teaching performed in the form of dialogical teaching as an opportunity to solve problems at the higher cognitive complexity dimension. To this, following the revised Bloom Taxonomy (Anderson & Krathwohl, 2001; Byčkovský & Kotásek, 2004), we include the following cognitive operations of the pupils: to analyse, to evaluate, to create. This entails the requirement for a teacher's concept of teaching to achieve these levels, i.e. the creation of such learning situations for the pupils in order to enable them to pursue an intentional dialogue (Šedřová, 2005). The aim of the paper is to present the implementation of problem teaching in a specific form of dialogical teaching with comparison of the primary and secondary schools. We analysed 20 videotapes of lessons, in which we first identified the form of the phenomenon observed (according to indicators of dialogue by the teacher and the pupil), after which we evaluated the problem assignments with higher cognitive complexity made by the teacher. We have been following the principles of dialogic teaching (Alexander, 2006), as it promotes not only a better understanding of the content taught, but also the pupils' communicative competencies.

Teachers' educational goals in everyday teaching practices

Keywords: Attitudes and beliefs, Educational policy, Qualitative methods, Teacher Effectiveness

Presenting Author:Kevin Zweeris, Leiden University, Netherlands

Education is not only about learning the knowledge, skills and dispositions necessary for work and life (qualification), but also about being initiated in traditions and ways of being (socialization), and about developing as a person and taking positions and responsibility (subjectification) (Biesta, 2015). Since the 1990s, the qualification function has been overly emphasized in education, thus marginalizing 'other' educational goals (Luijten, Visscher, & Witziers, 2005). In recent years, this has led to debates about the purposes of education (Biesta, 2012; Nussbaum, 2012; Dutch Education Council, 2013; 2016). Consequently, Dutch schools are required to develop a curriculum vision that entails the above stated three functions of education. This research project is aimed at gaining insights in teachers' educational goals, and how these relate to the three functions of education, and their schools' profiles. Using a goal systems laddering method (Janssen, Westbroek, & Doyle, 2013), teachers' goals in their everyday practices are visualized and discussed. Data will be gathered to better understand 1) teachers' educational goals in their everyday teaching practices, 2) the interrelatedness of these goals, 3) how teachers reflect upon achieving these goals, and what factors support or obstruct achieving their goals, and 4) how their goals are related to their schools' profile.

Current developments towards inclusive secondary schools – are teachers at risk?

Keywords: Educational policy, Qualitative methods, Secondary education, Teacher professional development

Presenting Author:Eva-Maria Bennemann, Technical University of Munich, Germany

Developments towards inclusive education can be observed in all German federal states. With far reaching changes for the teaching staff, especially on secondary school level. In the federal state of Baden-Wuerttemberg, reports from teachers and the results of an open online survey by a teachers union suggest that (negative) demands may have increased since the introduction of the new inclusive secondary school "Gemeinschaftsschule". Based on a teacher specific extension of the stress-strain model from work science this paper provides an insight into the (negative) demands the teachers face in those schools and presents indications for practical improvements. Do current reforms towards inclusive secondary schools put teachers at risk? What can be learned for future developments? This questions will be answered with the help of data from semi-structured interviews with 50 teachers and from participating observations in 10 schools over a period of two school years. The data was analysed in a multi-stage process with the qualitative content analysis of Philipp Mayring.

School counselors' perspective on and professional approach towards cultural diversity in Germany

Keywords: Cultural diversity in school, Multicultural education, Qualitative methods, Teacher professional development

Presenting Author:Josef Strasser, University of Koblenz-Landau, Germany

As it is unclear in as far school counselors in Germany are prepared to meet challenges that go along with cultural diversity an interview study was conducted. It addressed the following questions: 1) Are problems and challenges associated with cultural diversity relevant for counseling teachers' daily work? 2) In as far and in what ways do counseling teachers take the cultural dimension into account? 3) What is the basis of their professional action when dealing with cultural matters? 4) Do intercultural problems prompt their professional learning?

It was assumed that counselors' perception of and attitude towards cultural diversity in schools corresponds with their professional dealing with the situation. Hence one main objective of the research was to identify typical patterns of subject's perceptions and professional approach. Findings revealed major deficits concerning the subjects' professional knowledge of multicultural counseling. Three patterns of ways to approach cultural diversity and counseling tasks in school could be discerned.

Teachers' professional conversations about how to approach the programming content of the curriculum

Keywords: Educational policy, Qualitative methods, Teacher professional development, Technology

Presenting Author:Peter Vinnervik, Umea University, Sweden

This study reports a snapshot from ongoing professional development of a group (n=19) of Swedish in-service compulsory school teachers who prepare to implement a new national curriculum which introduces programming as core content in mathematics and technology. Insight into the preparation process was made possible through recorded conversations of three different groups of teachers, who had met to share experiences, thoughts and to discuss how to address programming in their teaching. The group conversations were transcribed and analysed using thematic analysis. The results of the study reveal that the preparation status, with less than five months to go before the new curriculum is effectuated, varies quite substantially between schools and teachers within the same municipality. The study aims to provide knowledge about how teachers navigate in an environment of change with respect to the particular characteristics attributed to programming in the revised Swedish curriculum for compulsory school. Further, the study seeks to contribute to the discussion of teachers' professional development conditions and needs in relation to expected outcomes of the new curriculum which could be valuable for policy and decision makers at both local, regional and national level.

Session G 20

13 August 2019 13:45 - 15:15

Seminar Room - S12

Poster Presentation

Cognitive Science, Educational Policy and Systems, Learning and Instructional Technology, Lifelong Learning, Teaching and Teacher Education

Teaching and Professional Development

Keywords: Arts, Cognitive development, Competencies, Content analysis, Cultural diversity in school, Design based research, Environmental education, Higher education, Qualitative methods, Religious studies, Self-regulation, Student learning, Survey Research, Teacher professional development, Teaching/instruction, Video analysis, Vocational education, Workplace learning

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Jaap Schuitema, University of Amsterdam, Netherlands

Vocational exploration and working conditions in internships from the perspective of young migrants

Keywords: Content analysis, Cultural diversity in school, Vocational education, Workplace learning

Presenting Author:Hannes Reinke, Otto-Friedrich-Universität Bamberg, Germany

The integration of migrants in education and labour market is one of today's most challenging tasks. Vocational exploration and choice can facilitate integration. The concept of vocational exploration includes strategies to gather knowledge of one's abilities and interests, vocations and the structure of the labour market. Therefore, successful vocational exploration coheres with self- and environmental reflection, and reflections of vocational options that lead to sustainable career choices. Especially for adolescents without essential knowledge about local labour markets and vocational requirements e.g. because of foreign cultural, social and educational backgrounds, finding a vocation is a difficult task. Hence, adolescent migrants in Germany are often placed in special programs within the

transition system that aim on preparing for vocational choice. For this purpose internships are applied as a measure for vocational exploration to provide adolescents access to enterprises and allow them to gather experiences at the work place as a fundament for self- and environmental exploration. However, there is controversial evidence on the effect of these internships for vocational exploration. Furthermore, students' perceived working conditions are not considered in the school-based didactical planning, conduction and follow up. This study focusses on students' perceived working conditions within the enterprises, where internships are conducted, and tries to illuminate its influence on vocational exploration. Therefore, 25 adolescent migrants were interviewed on conditions conducive to learning and development in internships and their career plans. The results of the content analyses will be discussed in the light of organisational and didactical operationalisation of internships.

Challenging young adults' intention-behavior-gap on sustainable consumption

Keywords: Environmental education, Higher education, Student learning, Survey Research

Presenting Author: Mona Off, Ludwig-Maximilians-Universität, Germany; **Co-Author:** Susanne Ritter von Marx, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Christine Kreuzer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Susanne Weber, Ludwig-Maximilians-Universität, Germany

Although sustainable development has been subject of discussion in the past, it is more relevant than ever in the present and will be one of the most important challenges for the future. Sustainable development is understood as inter- and intra-generational fairness addressing the use of resources integrating economic, ecological, and social aspects. Individuals' consumption behavior is identified as one critical source for supporting these claims and balancing these issues. However, sustainable consumption is characterized by an intention-behavior-gap, implying that individuals want to behave in a sustainable way but do not realize it. Lacking knowledge and emotions are assumed as decisive reasons of this phenomenon. In the field of business education, we run an innovative intervention using graphical videos to inform learners about sustainable consumption and to stimulate related emotions. The aim of our study is to influence learners' intention-behavior-gap in the domain of sustainable consumption. Therefore, we implement an intervention with Bachelor Students (N=55) using graphical videos. Results show that we could not only influence young adults' intention for sustainable consumption behavior (SCB) but also their realized SCB in daily life. Most influencing factors on realized SCB are as expected intention for SCB, gender and additionally monthly budget. From a theoretical perspective, our results are in line with meta-analyses on predicting realized behavior by intention. For the educational practice, we provide fruitful hints to stimulate SCB more efficiently and effectively for the future.

21st century skills, multiple literacies and development of RE teacher education

Keywords: Competencies, Religious studies, Teacher professional development, Teaching/instruction

Presenting Author: Martin Ubani, University of Eastern Finland, Finland; **Presenting Author:** Kaisa Viinikka, University of Eastern Finland, Finland

The purpose of this poster is to present a three-year research project "21st century skills, multiple literacies and development of RE teacher education" (2018-2021). It has been widely acknowledged that due to the increased multiculturalism, increased knowledge and changed demands for professionalism and expertise, the grown importance of ICT and social media in societies, the demands for teachers need new skill sets in their practice today and in future. In addition to these, the socio-demographical changes due to secularization and diversification of religions and beliefs among children and youth, the "return of religion" to the public sphere (Habermas 2006), the changes in the confessional basis of religious education toward more inclusive and dialogical emphases and new learning theories (Ubani 2018) are altering and have altered already the competence requirements of an RE teacher.

Effects of Tonal Competencies on the Development of Subskills of Musical Performance

Keywords: Arts, Cognitive development, Competencies, Teaching/instruction

Presenting Author: Zyxcban Wolfs, Open University of the Netherlands, Netherlands

Abstract A strong predictor of termination in music education is perceived lack of progress in musical skills. Students have a 50% chance of unintended termination in the first few years of music education if teachers do not provide adequate tools for solving stagnation quickly. In formal music education a strong focus on skills regarding sight-reading and performing rehearsed music is emphasized, leaving other skills like playing by ear and playing from memory underexposed, as well as the musical enculturation levels of music students. Many music students obtain implicit competencies only through musical enculturation whereas others receive explicit musical training to master specific skills. This research will focus on how music enculturation develops and optimally contributes to improving the quality of music education and performance. Data is collected from two separate samples: primary school children and cello players. The results of enculturation levels from primary school children will be used to form a baseline to estimate the age effect of developing tonal competencies and their relation to singing by ear and singing from memory. The results from the cello players will be used to assess the influence of tonal competencies on cello performance. The overall findings will be used to develop a more advanced evidence-based musical pedagogy for primary school children and cello players which takes into account the tonal competency development in childhood and its effect on subskills of musical performance.

Role of technology in fostering SRL strategies of finance professionals during uncertainty

Keywords: Design based research, Qualitative methods, Self-regulation, Workplace learning

Presenting Author: Vasudha Chaudhari, Open University, United Kingdom; **Co-Author:** Leonie Jacob, University of Regensburg, Germany; **Co-Author:** Allison Littlejohn, Open University, United Kingdom; **Co-Author:** Regina Mulder, University of Regensburg, Germany

Uncertainty is an inherent characteristic of the finance sector as evidenced by the current political upheavals such as Brexit, or economic ambiguities such as the impending threat of a trade war, or accelerated technological developments such as bitcoin technology. Using the theoretical lens of proactive work behaviour (PWB) a collaborative research project between University 1 (UK) and University 2 (Germany) is examining how finance professionals shape their work proactively and how technology can be used to foster this behaviour. This paper presentation reports the findings from remote moderated usability tests carried out with finance professionals to capture the role of technology in fostering self-regulated learning behaviour of finance professionals during times of uncertainty. We expect the study will provide insights in the role of technology in supporting the professionals to navigate their self-regulated professional learning during uncertain times.

Relationship between surface structures and error occurrence in the classroom

Keywords: Content analysis, Teacher professional development, Video analysis, Vocational education

Presenting Author: Patricia Köpfer, Goethe University Frankfurt, Germany

Students' errors in the classroom are assumed to contain a high learning potential. However, to enable students to learn from their errors, they need support. In our field of interest—business and economics education—teachers lack in dealing errors adequately and empirical evidence on how students learn from errors remains scarce. We work on this research gap and focus on students' errors in accounting education. In the present study, we aim to analyze teachers' action in real classroom situations and to examine the learning potential of students' errors from different perspectives by using mixed methods. We videotaped teachers' action in commercial schools and analyzed occurring error situations. In this proposal, we report first results from video observation concerning error occurrence and surface structure of the classrooms.

Session G 21

13 August 2019 13:45 - 15:15

Seminar Room - S15

Poster Presentation

Teaching and Teacher Education

Pre-Service Teacher Education and Teacher Professional Development

Keywords: Assessment methods and tools, Attitudes and beliefs, Case studies, Educational policy, Educational Psychology, Higher education, Integrated

learning, Interdisciplinary, Lifelong learning, Meta-analysis, Misconceptions, Pre-service teacher education, Quantitative methods, Secondary education, Self-efficacy, Special education, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Oddny Judith Solheim, Norway

Teachers' integrative pedagogical knowledge: Theoretical formulations and empirical findings

Keywords: Integrated learning, Interdisciplinary, Pre-service teacher education, Secondary education

Presenting Author: Mikko Niemelä, University of Helsinki, Finland

This presentation develops Lee Shulman's theory of pedagogical content knowledge by paying particular attention to the ways in which Shulman's categories of teacher's knowledge are constructing when viewed from the perspective of curriculum integration. In this way, a new category of integrative pedagogical knowledge is created. It serves as a tool for studying the kind of knowledge curriculum integration requires from teachers. The developed theory is then applied to empirical research for studying pre-service teachers' pedagogical thinking. It is essential to know how teachers are prepared for curriculum integration when they are entering service, because curriculum integration is now a task for every teacher according to the new Finnish core curriculum of basic education. Additionally, this gives us knowledge for developing teacher education programs to meet better the needs of curriculum integration. The presentation is a combination of a theoretical and an empirical study.

Europeanisation in teacher education: Case studies of Austria, Greece and Hungary

Keywords: Case studies, Educational policy, Lifelong learning, Teacher professional development

Presenting Author: Vasileios Symeonidis, University of Innsbruck, Austria

This paper aims to explore the process of Europeanisation in teacher education from an international and comparative perspective, analysing how and to what extent domestic teacher education policies and practices in Austria, Greece and Hungary have been influenced by European developments. Teacher education is understood as a complex policy ecosystem that is carried out through mechanisms, processes and key agents operating at local, national and European levels. Key themes in studying the Europeanisation of teacher education at those different levels are the following: the continuum of teacher professional development, the development of teacher competence frameworks, and the support to teacher educators. Data are collected through document review and expert interviews with policymakers and teacher educators, and they are analysed through process tracing and qualitative content analysis. Findings suggest that countries have moved in different ways closer to the direction of European developments in teacher education, but there was no transformative change as a result of Europeanisation.

Comprehensive analyses for single-case phase designs

Keywords: Assessment methods and tools, Educational policy, Meta-analysis, Quantitative methods

Presenting Author: René Tanious, KU Leuven, Belgium; **Co-Author:** Tamal Kumar De, KU Leuven, Belgium; **Co-Author:** Patrick Onghena, KU Leuven, Belgium

This paper illustrates how data obtained from single-case ABAB phase designs can be comprehensively analyzed. A comprehensive analysis should take into account changes in all data aspects mentioned in the What Works Clearinghouse guidelines (Kratochwill, et al., 2010) for analyzing single-case experimental data: level, trend, variability, overlap, immediacy, and consistency. This prevents focusing only on a limited number of data aspects which runs the risk of missing unexpected but potentially valuable effects of a treatment. We demonstrate how effect size measures for each data aspect can be calculated and integrated as test statistics in multiple randomization tests. Subsequently, we compare the obtained p -values for four scenarios: without multiple testing correction, with the multiple testing correction procedure proposed by Benjamini and Hochberg (1995), with the procedures using an adaptive correction suggested by Benjamini and Hochberg (2000), and the correction taking into account the dependency between the tests (Benjamini & Yekutieli, 2001). We argue that adopting this comprehensive analytical approach leads to a more thorough and complete understanding of new treatments in education and psychology, increases the transparency and replicability of research results, and strengthens the scientific rigor of single-case ABAB designs in general.

School Inclusion and Teacher Health

Keywords: Quantitative methods, Self-efficacy, Special education, Teacher professional development

Presenting Author: Milena Peperkorn, Institut für Erziehungswissenschaft, Germany; **Co-Author:** Katharina Müller, Institut für Erziehungswissenschaft, Germany

The health status of teachers is an important criterion for the quality of school learning. Changing work tasks or implementation of new job requirements can be associated with stress. Such changes arise in the context of the introduction of inclusive schools. Teachers health perception due to many new job requirements in the context of inclusive schools is in the focus of this work. Whether the perceived health experience of teachers differs with more or less inclusive work experience is the research question of the present paper. The present study is based on a survey of Lower Saxony teachers ($n=6712$). It recourse to the sense of coherence of Antonovsky (1997) in the operationalization of a social-ecological concept of health. This salutogenetic perspective enables the identification of activity-related health resources in the context of inclusive education. A confirmatory factor analysis approved the assumed factor structure of the model. Furthermore the measurement equivalence analysis, which is central to mean comparisons, shows that the used scales are configurational, metric, and scalar invariant across the groups. The comparison of the group mean shows that the health experience in both groups differs significantly in favor of the teachers with more experience.

Beliefs about a teacher's professional role: Changes during University Teacher Training

Keywords: Attitudes and beliefs, Higher education, Pre-service teacher education, Teacher professional development

Presenting Author: Daniel Mann, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:** Donata Mehler, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:** Jennifer Paetsch, University of Bamberg, Germany; **Co-Author:** Barbara Drechsel, University of Bamberg, Germany; **Co-Author:** Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany

Teachers' beliefs and attitudes are important factors for understanding and improving educational processes. Accordingly, beliefs play an important role in preservice teachers' training. Consequently, identifying preservice teachers' beliefs and their development is necessary to prepare pre-service teachers for teaching practice. Thus, teacher education is faced with the challenge to pick up already existing beliefs of students and enable them to critically reflect on them. One aspect of preservice teachers' beliefs is their understanding of their professional role. The aim of the present study is to gain further knowledge of how pre-service teachers' beliefs about a teacher's professional role change in the course of their training at university. For our analysis we used a sample of $n = 1009$ pre-service teachers of three different cohorts, based on the progress of their studies. We adapted an instrument from the BilWiss study to measure beliefs about a teacher's professional role. 19 items were merged into three subscales representing the perception of the teacher role as a broadcaster of knowledge, as a mediator of learning experiences, and as a diagnostician. Our tests reveal that especially the pre-service teachers at the beginning of university training differ significantly from the other two cohorts. While the perception of the teacher role as a broadcaster of knowledge tends to seem less important at the end of the university teacher training, the role of a teacher as a diagnostician is considered to be more important towards the end of the university teacher training.

A Review of Educational Psychology Misconceptions

Keywords: Attitudes and beliefs, Educational Psychology, Misconceptions, Pre-service teacher education

Presenting Author: Bobby Hoffman, University of Central Florida, United States; **Co-Author:** Morgan McAfee, Self-employed Educational Consultant, United States

When teachers harbor misconceptions or unjustified beliefs about teaching, learning, and academic motivation, the pedagogical consequences can be severe. These teachers may unintentionally perpetuate such false beliefs upon students through ineffective teaching strategies or misinterpretations of learning science. Misconceptions among teachers are particularly deleterious due to the substantial influence teacher beliefs exert upon curriculum development, pedagogy, and the construction of effective learning environments. Prior research has explicated the prevalence of erroneous beliefs about general psychology and

neuroscience among various populations, but has rarely examined misconceptions among teachers and has not evaluated teachers' misconceptions about pertinent topics in educational psychology. Consequently, this review highlights theoretical, inferential, and measurement concerns specifically related to educational psychology misconceptions.

Session G 22

13 August 2019 13:45 - 15:15

Seminar Room - S05

Poster Presentation

Cognitive Science, Culture, Morality, Religion and Education, Instructional Design, Learning and Special Education, Teaching and Teacher Education

Primary Education

Keywords: Attitudes and beliefs, Communities of learners, Comprehension of text and graphics, Content analysis, Culture, Mathematics, Misconceptions, Primary education, Problem solving, Qualitative methods, Secondary education, Self-regulation, Special education, Student learning, Teaching/instruction
Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Guy Durden, University College London, United Kingdom

How carry condition and problem size affect the solving of word problems

Keywords: Comprehension of text and graphics, Mathematics, Primary education, Problem solving
Presenting Author: Verena Dresen, UMIT, Health & Life Sciences University, Austria; **Co-Author:** Silvia Pixner, Institute of Psychology, UMIT, Health & Life Sciences University, Austria; **Co-Author:** Korbinian Moeller, Leibniz-Institut für Wissensmedien, Germany

Mathematical word problems consist of verbal *and* numerical information and a mathematical problem which has to be solved. Both linguistic and numerical factors account for their difficulty. Our study sets out to determine the influence of problem size and carry effect in arithmetic word problems including either an addition or a subtraction with two-digit numbers. We manipulated problem size (small vs. large) and carry operations (carry vs. no carry) while keeping linguistic factors identical. To this end we tested 128 children of the 3rd class elementary school by giving them two sets of items. We first presented the mathematical problem as a word problem and afterwards the same mathematical problem as an isolated numerical calculation in Arabic notation. Our findings show that a carry operation and a large problem size become significantly more difficult in word problems than in isolated calculations. Interestingly, the problem size effect seems to be more of a quantitative shift in difficulty, whereas the carry effect corresponds to a qualitative shift of the difficulty, which naturally affects the strategies applied by the children.

Rational number tasks in elementary school mathematics textbooks: A danger of misconceptions

Keywords: Content analysis, Mathematics, Misconceptions, Primary education
Presenting Author: Parvaneh Babari, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Lennart Schalk, PH Schwyz, Switzerland

Understanding and doing calculations with rational numbers (e.g., fractions, decimals) is highly challenging for students and even adults. In particular, students struggle to understand rational arithmetic. Braithwaite and Siegler (2018) sought for explanations of these problems and investigated middle school students' choices of solution strategies for solving arithmetic tasks with fractions in both the United States and China. They found that children relied strongly on mathematically irrelevant associations between fraction arithmetic operations and operand features. These associations seemed to arise from the unbalanced distribution of the arithmetic tasks in mathematics textbooks. We aimed to replicate and extend these findings by evaluating whether these irrelevant associations are also present in elementary school mathematics textbooks used in Switzerland and Germany, both for fractions and for decimals. The content analysis indicates that, both for fractions and for decimals, the textbook series show unbalanced distributions, too, while the skewness varies between textbooks. We currently conduct classroom studies on how this unbalanced distribution predicts errors of elementary school students when performing fraction and decimals arithmetic. At the conference, we will present our content analysis in detail as well as first findings from the classroom studies.

The nature of knowing and students in need of special education

Keywords: Attitudes and beliefs, Mathematics, Primary education, Special education
Presenting Author: Maria Lindfors, Umeå University, Sweden; **Co-Author:** Helena Roos, Linneus university, Sweden; **Co-Author:** Anette Bagger, Umeå University, Sweden

The purpose of this research is to explore teachers' mathematical epistemic beliefs in relation to students in need of special education in mathematics (SEM-students). Teachers' views on the subject and the students in need are central aspects for the support (Scherer, Beswick, DeBlois, Healey & Opitz, 2016). In more detail, the interest lies in revealing the epistemologies of teachers' beliefs on the nature of knowing in two very different educational practices: the general situation of the teaching and learning and in the practice of national testing. The research process is guided by four steps: 1; The identification of statements regarding the justification of and source of knowledge 2; The explanatory paraphrasing into groups of statements. 3; A search for concurrence, differences and patterns within and between groups. 4. Finally, a summary of what is characteristic for the nature of knowing in mathematics in relation to SEM-students in these two practices is given.

What kind of self-regulated learning supports exist for primary and secondary school levels

Keywords: Primary education, Secondary education, Self-regulation, Student learning
Presenting Author: Marika Koivuniemi, University of Oulu, Finland; **Co-Author:** Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

Successful students are skillful in self-regulating their learning, which helps them to overcome cognitive, motivational and emotional learning challenges. These skills also further contribute to students' wellbeing and learning results. However, regulating one's own learning is not always easy, and students could benefit from support targeted to these skills. Currently, while there exists different self-regulated learning (SRL) instruments supporting students SRL skills development, more information is still needed in order to develop efficient SRL supports for the practice. This study aims to review different SRL instruments, which are used in primary and secondary education, and explores what facets of SRL they support. It also considers the future needs to be taken into account when planning new SRL instruments. The results show that there is a need to design more SRL supports targeting on the motivational and emotional aspect of learning. In addition, the results indicate that there is a lack of SRL instruments that would give feedback on individual learning behavior and progress.

Exploring Epistemic Climates of Elementary School Students on Six Continents

Keywords: Communities of learners, Culture, Primary education, Qualitative methods
Presenting Author: Florian Feucht, www.ThinkingHabitats.com, United States; **Co-Author:** Regina Rotshtein, University of Toledo, United States; **Co-Author:** Kristen Porter, Mercy College, United States; **Co-Author:** Andres Acher, Martin Luther University Halle-Wittenberg, Germany; **Co-Author:** Valerie Frède, Université Toulouse - Jean Jaurès, France; **Co-Author:** Yue Gu, University of Toledo, United States; **Co-Author:** Andrea Mohme, School system Luebeck, Germany; **Co-Author:** Elizabeth Curtis, Queensland University of Technology, Australia; **Co-Author:** Jo Lunn Brownlee, Queensland University of Technology, Australia

Personal epistemology, beliefs about knowledge, is an important component for promoting deeper learning and higher-level critical thinking. Epistemic climate refers to the components in one's environment that influence their epistemology and has been conceptualized in educational contexts by the *Educational Model of Personal Epistemology* (EMPE). We studied 240 fourth-grade and sixth-grade students in six different countries: Argentina, Australia, Burkina Faso, China, Germany, and the US. Students were asked to provide a list of entities that looked like knowledge to them at school and at home. Children identified responsible adults, learners, learning materials, and instructional tools in their home and school environments, all of which align with the four components of the EMPE model. In addition, we identified three categories of entities not identified in the EMPE model: other non-humans, concepts, and processes. Components related

to human entities were more commonly identified by students in Australia and Germany than in other nations, as well as by sixth-graders more than fourth-graders. Understanding how young students perceive the epistemic climate around them, not only in early years, but also from a cross-cultural lens, provides important insights on how to create effective learning environments in an ever changing world of knowledge.

Concreteness fading with Montessori materials to teach mathematical equivalence

Keywords: Mathematics, Primary education, Student learning, Teaching/instruction

Presenting Author:Rosanna Cofone, University of Roma Tre, Italy; **Co-Author:**Giuseppe Bove, Roma Tre University, Italy; **Co-Author:**Paola Perucchini, Univeristy Roma Tre, Italy

The use of concrete versus abstract instructional teaching, in mathematics domain, is still debated. Provide a link between concrete manipulatives and symbolic supports learning and transfer. Concreteness fading is a model of instruction that promotes this connection through a three stage teaching that begins from real, concrete objects, moves to iconic stage and fade to abstract representation. The present study evaluated children's transfer after receiving instructions with concrete materials, abstract materials or concrete materials fading to abstract representation. Moreover, we examined effects of different manipulatives on the transfer outcomes, by comparing Montessori manipulatives (number rods and bead frame) and others manipulatives (puppets and balance) used by Fyfe and colleagues (2014). Children that received instructions in concreteness fading condition showed better performance in transfer of knowledge than children in abstract only or concrete only conditions. The use of Montessori or other manipulatives do not exhibit any significant difference in transfer outcomes. Children benefits learning with concreteness fading, regardless of the type of manipulatives used.

Session H 1

13 August 2019 15:30 - 17:00

Lecture Hall - H07

Invited Session

Rethinking tomorrow's education in South Africa

Keywords: Assessment methods and tools, Case studies, Knowledge creation, Philosophy

Interest group:

Chairperson: Gert van der Westhuizen, University of Johannesburg, South Africa

Discussant: Michael Samuel, South Africa

Thinking about tomorrow's education in South Africa, despite the advent of political democracy, requires rethinking thinking, i.e. thinking about the whole of the educational enterprise, its constitutive rules, and the prescriptive role of academia and Western Science (Odora Hoppers & Richards 2010). This Symposium is a contribution to rethinking thinking in education, and presents South African perspectives on one of the global challenges in considering tomorrow's education: the role of knowledge, how it is defined, and the imperative of inclusivity and education for all in the true sense of the word. The four papers submissions encourage debates to go beyond rhetoric and anticipate education for the future to contribute in the end to social justice in society.

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The African university in the neoliberal era

Presenting Author:Amasa Ndofirepi, University of Johannesburg, South Africa

The African university in the neoliberal era: in pursuit of socially-just knowledges in the 21st century This theoretical paper is critical exposé of the knowledge processes pervading African universities in the 21st century in which I make a case for socially-just epistemologies. My thesis is premised in three main claims namely 1) universities and the knowledge they produce and disseminate have a critical role in foregrounding the change and development agenda for the rebirth of Africa; 2) the production and mediation of knowledge is a genuinely political process (Weiler, 2011b) just as universities can be considered among the most political institutions in society (Ordorika, 1999) and 3) the recontextualisation and transformation of university epistemologies (Weiler, 2011a) is a prerequisite for an authentic postcolonial African university. I argue against the pervasive neoliberalism complemented with discourses of globalisation and the knowledge economy originating from the North which continue to significantly shape university knowledge systems in Africa as I show theoretical evidence of how the contemporary African university lacks genuine critical discussion especially in the context of the perpetual hegemonic unequal epistemological paradigms. Noting that contemporary knowledges in African universities continue to maintain the erstwhile colonisers' curricula content and pedagogy years after political independence, I proffer an argument for democratic epistemic spaces in the universities in Africa that are socially just serving the interests and priorities of Africa first before looking at the global.

Moving beyond the rhetoric of decolonisation: From education for all to education for relevance

Presenting Author:Labby Ramrathan, University of KwaZulu-Natal, South Africa

Gripped in the fierce debates in decolonisation unfolding within South Africa, this paper attempt to move beyond the rhetoric by exploring school education from situated analysis to understand and find prospective solutions on why the school education system is failing its nation. Empirical evidence through case studies of schools within KwaZulu-Natal, using interviews with teachers and learners and observations of teaching and transact walks into communities, revealed that the national school curriculum does not meet the needs and aspirations of the learners. It is highly structured, rigid and all learners are expected to take the same curriculum structure irrespective of the diversity of learners and the diversity of the learning environments. Most teachers reported that they are not able to teach according to the curriculum plan as they are disrupted by the contextual challenges that learners find themselves in and the daily issues that the learners present themselves with in class and which teachers have to respond to. Hence their formal teaching time is substantially reduced. Learners, equally, have little interest in learning the formal curriculum and attend school because they have to as part of their growing up. Hence their focus on schooling is only on passing the assessment for grade progression. The paper contributes to the debates on decolonisation of school curriculum with suggestions on how to move forward beyond such debates.

Decolonisation, cognitive justice and teacher education

Presenting Author:Gert van der Westhuizen, University of Johannesburg, South Africa

Teacher education in South African is confronted by calls for the decolonisation of knowledge, requiring inquiries into what the knowledge crisis in education is all about and what the implications are for changes in policies and practices. These are the contextual imperatives, described as knowledge injustice (Odora Hoppers 2001; 2002), subjugation (Keet 2014), and exclusion (Mbembe 2015), despite the political democracy and transformation of education policies of 1994. This paper explores notions of cognitive justice, i.e. the right of citizens and communities to have their knowledge included as in curricula. Drawing on the work by Visvanathan (2006; 2011), Odora Hoppers (2009; 2013) and De Sousa Santos (2007; 2015), this paper is an analysis of perspectives of cognitive justice in order to identify criteria which can be used to review teacher education policies and practices. A selection of criteria/guiding principles of cognitive justice are used for an exemplary evaluation of a teacher education policy document currently under review, namely "The minimum requirements for Teacher Education Qualifications" (DHET 2015). This policy includes descriptions of required "knowledge mixes" in teacher education programmes. The evaluation of the policy in terms of CJ principles indicate that assumptions made about knowledge, knowledge plurality and inclusion need to be clarified, and goals of cognitive reconstruction articulated. Findings of this evaluation confirm the need to rethink teacher education in SA on deeper levels, especially with a view of transforming education for the future. Implications for thinking about the future of education internationally, are explored.

Change and continuity in doctoral supervision: A case study of a South African University

Presenting Author:Michael Samuel, University of Kwazulu-Natal, South Africa

This paper explores a case study of a single university in post-apartheid South Africa as it addresses the challenges of the backlog of doctoral productivity. The paper foregrounds that quests for alternative models of doctoral supervision/learning are being undercut by dominant performativity and econometric rationalities. That which is rewarded by the systemic levers to promote doctoral education (subsidy allocations, financial incentives to staff, institutional reputation), drive the agenda rather than the examination of the quality of the contribution of the doctoral graduate is likely to make in the future society. Data is drawn from specific doctoral education projects of the institution in its School of Education, in the wider institutional context and in collaboration with international partners. The systemic discourses of output tend to negate the goals of exploring locally relevant worthwhile knowledge, and agendas of competition dominate the higher education environment. Despite efforts to engage alternatives such as collaborative cohort models of supervision, decolonising the nature of the relationships with international partners, as well as supporting through mentoring development of novice staff and doctoral candidates, the system rewards those who demonstrate a "return on investment logic". The paper presents paradoxical metaphors of knowledge construction that infuse this contradictory curriculum space of doctoral education. The challenges for the expansion of the doctoral research institutionally, nationally and continentally are highlighted. Failure to attend to these present rationalities is likely to place South Africa and Africa at the continued lower rungs of contributing to worthwhile global theoretical knowledge through its PhD endeavours.

Session H 2

13 August 2019 15:30 - 17:00

Lecture Hall - H05

Invited Session

Instructional Design

EFG: Bridging Cognitive Load and Self-Regulated Learning: From Metacognition to Mental Effort and Back

Keywords: Instructional design, Metacognition, Motivation, Primary education, Problem solving, Self-regulation, Technology

Interest group: SIG 06 - Instructional Design, SIG 16 - Metacognition

Chairperson: Anique de Bruin, Maastricht University, Netherlands

Organiser: Alexander Renkl, University of Freiburg, Germany

Organiser: Anique de Bruin, Maastricht University, Netherlands

Discussant: Rakefet Ackerman, Technion - Israel Institute of Technology, Israel

Modern complex learning environments provide great opportunity for knowledge acquisition, but may also put too high demands on learners' self-regulation capabilities and, therefore, may induce cognitive overload. As a result, learners may fail to devote sufficient mental effort to the central learning contents. However, little is known as to how learners monitor and regulate effort in complex learning environments. This topic inherently and simultaneously relates to matters of cognitive load and to matters of self-regulated learning. This symposium provides preliminary insights from EFG3 members' research cross-linking the areas of cognitive load and self-regulated learning. Baars et al. present results of a meta-analysis on the relation between mental effort ratings and metacognitive judgments (i.e., judgments of learning). Stebner et al. analyzed the effects of training how to apply metacognitive strategies to cognitive strategies on later cognitive load and efficiency. Postema et al. investigated how the cognitively highly demanding task of self-monitoring can be supported by having students inspect their own on-task eye movements, and how self-monitoring is affected by inspecting a correct modeling example of on-task eye movements. Moning and Roelle examined how induced mastery versus goal orientations influenced mental effort into learning protocol writing, quantity and quality of (meta)cognitive processes, focus of cognitive processes, learning efficiency, and learning outcomes. Together, these studies underline the promise and potential of concurrently measuring and linking mental effort and self-regulation processes as a means to address contemporary issues in educational science.

The relation between subjective mental effort measures and judgments of learning: a meta-analysis

Presenting Author: Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:** Anique de Bruin, Maastricht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Accurate self-monitoring of the learning process and using that information to regulate further learning activities are prerequisites for effective learning. Because most monitoring judgment are inaccurate which can have detrimental effects on regulation of learning, it is important to know more about how students make monitoring judgments to be able to design appropriate instructional support. Research has shown a relation between effort and monitoring judgments. This relation could be driven by data or goals, resulting in a negative or positive correlation between effort and monitoring judgments. The aim of the current study was to use a meta-analytic approach to summarize the results from several studies on the relation between subjective mental effort and monitoring judgments. Results showed a strong negative association between mental effort ratings and JOLs when learning to solve problems in primary and secondary education. When students experience higher mental effort, they tend to give lower monitoring judgments. This seems to indicate that subjective mental effort was used as a cue to make monitoring judgments. Furthermore, the negative association suggests that students interpreted the learning materials in a data-driven way.

Effects of promoting self-regulated learning on mental effort and mental efficiency

Presenting Author: Ferdinand Stebner, Ruhr University Bochum, Germany; **Co-Author:** Corinna Schuster, Ruhr University Bochum, Germany; **Co-Author:** Melanie Trypke, Ruhr-University Bochum, Germany; **Co-Author:** Detlev Leutner, University of Duisburg-Essen, Germany; **Co-Author:** Joachim Wirth, Ruhr-University Bochum, Germany

Numerous studies have shown that learning strategy trainings which address both metacognitive and cognitive learning strategies have beneficial effects on self-regulated learning. However, most of these studies neglect students' cognitive load when analyzing training effects although combining metacognitive strategies with cognitive strategies might be mentally demanding. In this study, 34 classes with 866 fifth- and sixth-grade students were randomly allocated to two training conditions and one control condition. In 15 weeks, the students of the training conditions learned how to apply metacognitive strategies to cognitive strategies in order to learn in a self-regulated manner. The students' intended metacognitive strategy application was assessed in two fictive learning situations before, directly after, and twelve weeks after the training. Additionally, invested mental effort was measured and mental efficiency was calculated. The results reveal that mental effort decreased in all three groups from beginning to follow up, indicating an effect of repetition. At the same time, mental efficiency of the training condition students increased due to the fact that they also scored higher in the post and follow up strategy test. From a theoretical and empirical perspective, cognitive load theory and especially the mental efficiency data reveal to be a valuable addition when analyzing the effectiveness of trainings on self-regulated learning.

Using Gaze Displays to Foster Self-Monitoring

Presenting Author: Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Christine Postema, University of Tübingen, Netherlands; **Co-Author:** Julius Meier, Utrecht University, Netherlands; **Co-Author:** Anne Schueler, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Diederick Niehorster, Lund University, Sweden; **Co-Author:** Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Effective self-regulated learning relies on accurate self-monitoring, which in turn requires keeping track of one's actions while performing a learning task and comparing these to a standard of the desired level of performance. This keeping track in itself is highly cognitively demanding (in a way, it is a dual task), but on highly visual tasks, it is even more challenging as there are few overt actions being performed. Moreover, in terms of standards, the lack of overt actions makes it hard to observe what a good performance looks like. Eye tracking technology may provide a solution, by making invisible cognitive actions visible. We present two studies on the use of gaze displays to foster monitoring in visual learning tasks. In Study 1 ($N=96$), participants studied illustrated texts and were then provided with a display of their own eye movements prior to making monitoring judgments. In Study 2 ($N=141$), participants learned to classify visual stimuli and were shown a good performer's gaze display as feedback. In the control conditions, no gaze displays were shown. In both studies, learning outcomes and changes in visual attention over time were analyzed. Results will be available at the conference.

Self-Regulated Learning by Writing Learning Protocols: Do Learners' Goal Orientations Matter?

Presenting Author:Jasmin Moning, Ruhr University Bochum, Germany; **Co-Author:**Julian Roelle, Ruhr-University Bochum, Germany

Learning protocols in which learners are prompted to engage in cognitive and metacognitive processes of self-regulated learning are a promising learning task. However, previous research indicates that learners often do not exploit the full potential of learning protocols. More specifically, although the effectiveness of learning protocols is enhanced by metacognitive processes, learners rarely invest sufficient effort in them even when they are prompted to do so. The present study investigated whether one reason for the underutilization of metacognitive processes is that learners adopt suboptimal goals while writing learning protocols. More specifically, we examined whether the induction of state mastery versus state performance goal orientation influenced invested mental effort into protocol writing, quantity and quality of metacognitive and cognitive processes, focus of cognitive processes, learning efficiency and learning outcomes. Before writing a learning protocol, high-school students were told either to improve their comprehension during writing and to expect self-referential feedback (*state-mastery-goal-orientation condition*) or to demonstrate a high level of comprehension during writing and to expect normative feedback (*state-performance-goal-orientation condition*). Results demonstrated that state-mastery-goal-oriented learners achieved higher learning outcomes and higher learning efficiency than their counterparts. At the conference, we will also present analyses that test whether the state-mastery-goal-oriented learners learned more efficiently than the state-performance-goal-oriented learners because they focused to a higher extent on content items they had not yet mastered, and whether the quantity and quality of cognitive processes and the quality of metacognitive processes mediated the effect of state goal orientation on learning outcomes.

Session H 3

13 August 2019 15:30 - 17:00

Lecture Hall - H10

Symposium

Higher Education

Alternatives to self-report measures in research on learning and teaching in higher education

Keywords: Cognitive skills, Competencies, Comprehension of text and graphics, Emotion and affect, Higher education, Mixed-method research, Motivation and emotion, Qualitative methods, Quantitative methods, Reasoning, Student learning

Interest group: SIG 04 - Higher Education

Chairperson: Anna Parpala, University of Helsinki, Finland

Chairperson: Telle Hailikari, University of Helsinki, Finland

Organiser: Liisa Postareff, University of Turku, Finland

Discussant: Daniel Dinsmore, University of North Florida, United States

In higher education research, there is an increasing interest to move on from the use of pure self-report measures (such as questionnaires and interviews) to the use of new measures to explore teaching and learning. The common challenges of self-report methods include their difficulty to detect unconscious processes of learning and teaching in real-time, as well as individual differences in how people describe their subjective experiences. Online methods are needed to investigate learning and teaching in a more reliable, objective and timely manner. The four contributions of the symposium adopt different kinds of online measures, or combinations of both online and self-report measures. The first contribution uses eye-tracking to explore the role of prior knowledge and task interest in learning from text. The second contribution investigates learning gain using a combination of self-report surveys and test-like, open access instrument measuring reasoning ability. In the third contribution, a performance-based test in the form of role-plays is used to assess students' communication skills. The fourth contribution explores academic emotions and physiological arousal of teachers and students through using smart ring biosensors and a smart device application. These contributions illustrate how understanding of learning and teaching can be advanced through using alternative methods instead of, or in addition to pure self-reports. The benefits of such methods in research on learning and teaching, as well as challenges related to their use, are at the core of the symposium and will be addressed by the discussant.

Can eye movements inform us on the role of task interest and prior knowledge in learning from texts?

Presenting Author:Margot Chauliac, University of Antwerp, Belgium; **Co-Author:**Leen Catrysse, University of Antwerp, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium

In higher education the ability to understand texts and to learn from them form an important key in achieving academic success. However, academic texts can be tough to read and not everyone is equally gifted to process these texts successfully. This can be attributed to the fact that learners have misconceptions about certain topics. Students need to let go of incorrect foreknowledge in order to be able to process the correct information. This is not always an easy process. Previous research indicates that a refutation text can facilitate the conceptual change that is needed to let go of possible misconceptions. The sample for this study consisted of 92 bachelor students who participated in a one hour eye-tracking study during which they were asked to read two texts: a refutation text and an expository text. Before as well as after the reading, students received a knowledge text. After reading a questionnaire on task interest was carried out to measure their involvement on the topic. Student's eye movements were followed during the whole study using the Tobii pro/ x3-120 eye tracker. Preliminary results point out that when learners' foreknowledge is higher they will process the refutation text faster than others with the same level of prior knowledge reading a standard expository text. Results also show that topic interest influences text processing. A learner who is interested and has a well-developed prior knowledge will process an expository text more thoroughly compared to students with a similar knowledge profile processing a refutation text.

Integrating an open-access test in student learning survey: conceptual and methodological challenges

Presenting Author:Sonia Ilie, University of Cambridge, United Kingdom; **Co-Author:**Jan Vermunt, Eindhoven University of Technology, Netherlands; **Co-Author:**Anna Vignoles, University of Cambridge, UK, United Kingdom

A longitudinal study of learning gain with over 2000 English students used a combination of self-report and test-like instruments to capture a set of skills, abilities and competencies making up subject-adjacent learning gain. The test-like instrument was an open-access measure of reasoning ability, derived specifically for the purposes of the study, from items in the ICAR public-domain repository. This paper introduces the measure, its development, underlying structure, and reports on methodological and conceptual challenges associated with its inclusion. On a methodological level, the measure emerges from the empirical analysis as valid, reliable, and confirming its hypothesised structure, while also quick, easy to implement, and not related to drop-out from the survey. Conceptually, hypothesised relationships to other cognitive and metacognitive constructs measured in the survey are not observed in the empirical data. The paper puts forward a set of explanations as to why this may be the case (relating to the sample make up, nature of the construct, and of the measurement), with work currently on-going likely to provide further explanatory results.

New formats of assessing of communication skills in higher education

Presenting Author:Edith Braun, Justus-Liebig-Universitaet Giessen, Germany; **Co-Author:**Isabel Hofmeister, University of Kassel, Germany; **Co-Author:**Ulrike Schwabe, DZHW - German Centre for Research on Higher Education and Science Studies, Germany

One of the main objectives of higher education (HE) consists in preparing students for the demands of the labour market. This implies that not only discipline-specific competences and expert knowledge need to be acquired during higher education, but also more generic competences like communication skills. In order to be able to assess such generic learning outcomes of HE, performance-based test instruments are required.

Within this contribution, the format of such a performance-based test of students' communication skills will be presented. In-vivo role-plays are used to assess the students' communication skills. Furthermore, discipline-specific competences are additionally measured to explore the relationship of generic and discipline-specific competences.

The sample consists of 488 students from 10 different HE institutions within Germany.

There are positive associations between communication and discipline-specific knowledge. The correlation between the assessed communication and discipline-specific competences is around $r=.30$.

Taking the traditional identity of HE institutions into account, mainly focusing on cognitive and discipline-specific competences, the meaning of reinforcing

competences that enable to handle and manage new and complex situations successfully as well as explicitly measuring learning gains is revealed. New formats of assessment will be necessary to meet these changing requirements.

Combining self-report data and physiological data in examining academic emotions

Presenting Author:Liisa Postareff, University of Turku, Finland; **Co-Author:**Petri Nokelainen, Tampere University, Finland; **Co-Author:**Laura Pylväs, University of Tampere, Finland; **Co-Author:**Julius Yläne, University of Turku, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland

Research on academic emotions of students and teachers has for long relied on self-report measures. For various reasons, the use of more objective measurement of emotions is needed. The current study explores university teachers' and students' academic emotions through combining self-report data with physiological measurement of electrodermal activity (EDA) during authentic teaching-learning episodes. EDA reflects physiological arousal, which is measured through smart rings in the current study. The self-report data is collected through a smart device application Learning Tracker, where respondents report their emotional states in real-time. This enables us to detect how self-reported positive (e.g. enthusiasm) or negative (e.g. anxiety) emotions are associated with different levels of physiological arousal. The data is collected during authentic teaching-learning episodes. Through combining these two data sets, it was shown that negative emotions had a stronger effect on arousal than had positive emotions among students. Results concerning teachers' arousal and emotions and the relations between them will be presented at the conference. Combining physiological measurement of arousal and self-reported emotions reported through the Learning Tracker expands our understanding of the role of emotions in authentic teaching-learning contexts. The results can be utilised in designing meaningful teaching-learning environments and in enhancing well-being of students and teachers.

Session H 4

13 August 2019 15:30 - 17:00

Lecture Hall - H08

Symposium

Assessment and Evaluation

Conceptual and methodological challenges for valid inferences on educational effectiveness

Keywords: Achievement, Assessment methods and tools, Psychometrics, Quantitative methods, Science education, Student learning, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Alexander Naumann, Germany

Organiser: Stephanie Musow, University of Teacher Education St.Gallen, Switzerland

Organiser: Alexander Naumann, Germany

Discussant: Charalambos Charalambous, University of Cyprus, Cyprus

The present symposium is concerned with current issues and methodological challenges related to the validity of inferences drawn from educational assessments. Educational assessments are central to empirical educational research and evidence-based policy-making. Accordingly, researchers as well as policy-makers in many cases heavily rely on students' responses to test or questionnaire items to draw inferences on individual students, teachers, teaching, schools, etc. Yet valid inferences require that there is empirical evidence supporting such test use and interpretation in educational contexts. The four presentations address two issues central to the valid interpretation of educational assessments, (a) when drawing inferences on teaching or schools, how can we ensure that tests and questionnaires are capable of capturing (effects of) classroom instruction? and (b) when drawing inferences on individual students, how can we generalize from a small sample of test items to a broader domain? The first presentation investigates the extent to which test items are capable of capturing effects of the content and the quality of classroom instruction. The second presentation deals with the use of student ratings to measure teaching quality within different grade levels and domains. The third presentation introduces a validity framework to evaluate some interpretive inferences of science assessments. Finally, the fourth presentation addresses the role of item covariance structures on the classroom-level in student achievement test data. Taken together, all presentations aim at providing validity evidence for use and interpretation of educational assessments, fostering the development of adequate assessments capable of detecting effectiveness at different levels.

Instructional Sensitivity of Test Items: The Challenge of Incorporating Instructional Measures

Presenting Author:Stephanie Musow, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Alexander Naumann, DIPF | Leibniz-Institute for Research and Information in Education, Germany; **Co-Author:**Jan Hochweber, University of Teacher Education St. Gallen, Switzerland; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany

Instructional sensitivity relates to the extent to which a test or a single item reflects effects of classroom instruction (Polikoff, 2010). Substantiating instructional sensitivity is important when students' test scores are used for evaluating teaching effectiveness: If instruments are not instructionally sensitive, valid inferences on teaching effectiveness based on test scores are precluded (Popham et al., 2014). While researchers have asserted that widely-used statistical sensitivity measures do not per se allow for valid inferences on instruction (e.g., van der Linden, 1981), it is unclear how to incorporate instructional measures into the evaluation of instructional sensitivity. Thus, we aim at investigating the extent to which instructional sensitivity measures are related to measures of (a) teaching quality and (b) content of instruction. We expect instructionally sensitive items to become easier with higher teaching quality and implementation of content in class. The sample for our analyses comprises 824 fifth-graders in 48 classrooms participating in a math assessment at two measurement occasions throughout the school year 2016/2017. Teaching quality was assessed via student questionnaires. In addition, teachers provided information on the implementation of teaching objectives. All analyses are carried out using the longitudinal multilevel IRT model to measure instructional sensitivity (Naumann, Hartig, & Hochweber, 2017). The results indicate (a) that the instructional measures partially explain statistical item sensitivity, (b) that it makes a difference which kind of measure is used to evaluate instructional sensitivity, and (c) that the relationship of instructional measures and items' sensitivity depends on the item under investigation.

Subject-specificity of Students' Teaching Quality Perceptions

Presenting Author:Ann-Kathrin Jaekel, University of Tuebingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany; **Co-Author:**Wolfgang Wagner, University of Tübingen, Germany; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany

In this study, we investigated the subject-specificity of student ratings on different dimensions of teaching quality (monitoring, amount of disturbances, motivation, and advanced exercises). Student ratings were assessed for both mathematics and German language lessons in secondary schools in Baden-Württemberg (Germany). Survey data stemmed from 6.038 fifth to tenth graders from 375 classrooms. Multilevel confirmatory factor analysis on within classroom- and between classroom-level revealed that students' perceptions of teaching are comparable in different subjects. Even at classroom-level the results revealed some correlations of specific factors across subjects. The highest correlation was found for disturbances, whereas all other factors showed lower, in part even negative correlations that might reflect reference effects. The findings are relevant for research on learning and instruction as they address the question of whether students are able to rate teaching quality in different subjects and differ between different teachers.

Testing the Generalization to the Domain Inference

Presenting Author:Maria Araceli Ruiz-Primo, Stanford University, United States; **Co-Author:**Min Li, University of Washington, United States; **Co-Author:**Jim Minstrell, Facet Innovations, United States

This paper proposes a validity framework to evaluate some interpretive inferences of science assessments, specifically, the paper will focus on the "sampling principle of testing" (Koretz, 2005). The paper will present an item development approach that uses contextualized items to test the generalization-to-the-domain inference – the *generalization* from students' performance in a small sample of items, to the mostly unmeasured performance in the larger domain. Using different contexts in items allows to ask students questions tapping the same construct under different scenarios. The paper provides information about items that have been already piloted in sixteen classrooms (347 students). Results from the pilot study indicate that difficulty of items varied by context. Overall, students' performance and inferences made about the targeted topic vary depending on the sample of items used. The paper will provide other sources of

validity evidence and data of a second iteration of data collections that is currently taking place.

Dimensionality of Achievement Measures: The Role of Group-Level Item Covariance Structures

Presenting Author:Alexander Naumann, DIPF | Leibniz-Institute for Research and Information in Education, Germany; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany

Student assessments are widely used in educational research and evidence-based policy-making (Creemers & Kyriakides, 2008). In recent years, student achievement has become a major criterion for evaluating teaching effectiveness (Marsh et al., 2012). Commonly, if students achieve high test scores, teaching is regarded as effective. However, such claims on teaching effectiveness based on students' achievement require establishing links between the empirical test data and the inferential target as validity evidence (Levy & Mislevy, 2016). However, while educational research puts much effort in fostering valid measurements of group-level teaching characteristics using student ratings, comparably less effort has been put into the meaning of achievement measures at the group-level so far. Consequently, whether the same dimensional structure of achievement holds at the group-level and – with respect to growth or change measures – at different points in time is rather unclear. Thus, the present study aims at modeling the (multi-)dimensionality of achievement at the classroom-level. We advance a longitudinal multilevel IRT (LMLIRT) model proposed by Naumann and colleagues (2017) to allow for the investigation of group-level multidimensionality. We exemplarily apply our approach to simulated and empirical achievement test data. Results suggest that the approach works well. In simulated data, multidimensionality was reliably detected. However, evidence supporting group-level multidimensionality is ambiguous in exemplary analyses of empirical data. In summary, the model allows for checking whether the assumption of unidimensionality holds or whether multidimensional scaling is advised on the group-level.

Session H 5

13 August 2019 15:30 - 17:00

Seminar Room - S01

Symposium

Higher Education

Student involvement in the co-creation of education: benefits, challenges and examples from practice

Keywords: Educational policy, Higher education, Instructional design, Student learning, Synergies between learning teaching and research, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 04 - Higher Education

Chairperson: Karen Könings, Maastricht University, Netherlands

Organiser: Karen Könings, Maastricht University, Netherlands

Discussant: Jeroen Bron, Netherlands

Collecting written student feedback on education is common practice in higher education. Effects on educational practice, however, are often limited and students prefer to have a voice in educational design. There is growing attention for the role of students in the design process and internationally students are starting to be increasingly valued partners in co-creating education. Listening to students' voice is essential, but this process is also challenging for teachers, academic developers, and students. This symposium brings together four projects that contribute to a deeper understanding of why co-creation is needed and possible approaches. The first presentation shares the benefits of co-creation for the quality of education, and the participating teachers and students in Scottish universities. The second presentation focuses of student preferences in student-staff partnerships and the challenges regarding the student role in decision-making processes, as experienced at a Dutch university. In the third presentation, Hungarian experiences of teachers and students are presented, emphasizing the need for preparing students for their role in co-creation and the impact of the school culture. In the last presentation, findings from a literature study are reported in which co-creation literature in education is compared with literature on shared-decision making with patients in health care. This deepens the understanding of co-creation and provides inspiration for valuable approaches to be introduced in education. This symposium will be a collaboration between presenters and audience members, with ample of room for questions, suggestions, and discussion. Additionally, our discussant reflects on the diverse presentations, sharing insights and expertise.

Conceptualisations and Benefits of Co-Creation of the Curriculum in Higher Education

Presenting Author:Tanya Lubicz-Nawrocka, University of Edinburgh, United Kingdom

Co-creation of the curriculum is a relatively new form of curriculum development in which students and staff are engaged to work in partnership so that each has a voice and a stake in higher education. This research aimed to explore how undergraduate students and staff members at Scottish universities conceptualise co-creation of the curriculum, and the benefits of engaging. Qualitative data was gathered at five Scottish universities across nine subject areas, including twenty semi-structured interviews and one focus group with student and staff co-creators and four focus group discussions with engaged students and staff who were not previously familiar with co-creation of the curriculum. All participants were active in student engagement initiatives including co-creation of the curriculum, student representation, and/or reflection on student engagement practices. Qualitative data collection focused on individuals' conceptualisations of student engagement, co-creation of the curriculum, and aims of higher education. The data were analysed using aspects of constructivist grounded theory, using an inductive approach and constant comparison methods. The research findings show benefits of co-creation of the curriculum in Scottish universities on: a) student and staff personal and professional development, b) engagement and fulfillment from learning and teaching, and c) skill development to encourage civic participation. Implications for both individuals and their communities will be discussed as they gain competencies, knowledge, and skills to deal with an ever-changing, complex world.

Students' perceptions regarding student-staff partnerships for improving education

Presenting Author:Samantha Martens, Maastricht University, Netherlands; **Co-Author:**Annemarie Spruijt, Utrecht University, Netherlands; **Co-Author:**Ineke Wolfhagen, Maastricht University, Netherlands; **Co-Author:**Jill Whittingham, Maastricht University, Netherlands; **Co-Author:**Diana Dolmans, Maastricht University, Netherlands

Students do not always have the feeling their input for improving education is being taken seriously. A student-staff partnership might ensure that staff will consider students' improvement suggestions: A collaboration whereby students and staff members contribute equally to decision-making and implementation processes for improving education. However, there remains a paucity of evidence about the question how students currently perceive their student-staff collaboration and whether students are willing to participate in student-staff partnerships. Questionnaires and focus groups were conducted to gather more insights in student-staff partnerships. We noticed that since students are not both involved in providing advice and in the implementation process, they do not fully experience student-staff partnerships yet. Students mention they are willing to be involved as equal partners for improving education due to their unique perspective on education, although not in the same way. Both students and staff members' roles should be clarified and communicated. For creating partnerships, students should be empowered first.

Student Voice – the Bridge to Learning: Hungarian experiences

Presenting Author:Anna Imre, Eszterházy Károly University, Hungary

The paradigm shift in education has been a central issue in educational research for decades. Education is no longer characterized in terms of what teachers teach but rather in terms of what students are able to do with their knowledge. Therefore, significant change in the pedagogical culture should transform from teacher-centred teaching to student centred learning. In Hungary the process of paradigm shift seems to be slow and shows great diversity depending on school characteristics, teachers' professional expertise and students' social backgrounds. Within the ERASMUS project *Student voice - the bridge to learning (BRIDGE)* a study was done in Hungary that aimed to explore students' and teachers' attitudes towards Student Voice, related to teaching and learning processes and school life in different educational contexts. The study followed the BRIDGE Evaluation and Methodology Framework. In three schools we collected quantitative and qualitative with students and teachers about student engagement and the use of personalised methodology. The most important

background variables were students' social background and teachers' work experience. In our analysis we compared the opinion of students and teachers about Student Voice and found remarkable differences between them. Our findings emphasize that teachers need to pay more attention to Student Voice.

Co-creation in education: challenges and approaches

Presenting Author:Karen Könings, Maastricht University, Netherlands; **Co-Author:**Serge Mordang, Maastricht University, FHML, Dept. of Educational Research and Development, Netherlands; **Co-Author:**Frank Smeenk, Maastricht University, Netherlands; **Co-Author:**Laurents Stassen, Maastricht University, Netherlands

Student-centered education places the students in a central position, but still teachers are very much in charge in the educational design process. Nowadays there are ever more developments in which 'end users' want their perspective to be taken seriously and to be involved in decision-making. There is a growing body of co-creation initiatives with students, as well as shared-decision making with patients. Implementation however remains a challenge. This paper aims to better understand why it is so hard to involve students in co-creating their education and how this process can be supported. In a literature study, we connected research done on co-creation in education with the body of literature on shared-decision making in health care, to enrich our insights on how to support co-creation in educational design. For both students and patients, similar challenges exist, like feeling undervalued. Teachers and doctors also have similar challenges as they both assume they have a paternalistic role, and experience discomfort when collaborating with students/patients, as it threatens their authority. Additionally, educational institutions and hospitals do often not have regulations or norms on co-creation. Teachers' struggle with co-creation partly stems from the experience that their own voice is less heard in the design of education. Although several approaches are available to overcome co-creation challenges, like a focus on appreciative contribution, relationship building, and the support of key individuals, co-creation can learn from other domains. Shared-decision making provides new ideas, like hands-on instructions, training methods and evaluative programs, to sustainably implement co-creation in education.

Session H 6

13 August 2019 15:30 - 17:00

Lecture Hall - H11

Symposium

The development of multiplicative reasoning: early foundations and the role of instruction

Keywords: Cognitive development, Conceptual change, Mathematics, Numeracy

Interest group: SIG 03 - Conceptual Change

Chairperson: Xenia Vamvakoussi, University of Ioannina, Greece

Organiser: Xenia Vamvakoussi, University of Ioannina, Greece

Organiser: Wim Van Dooren, KU LEUVEN, Belgium

Discussant: Konstantinos Christou, University of Western Macedonia, Greece

Multiplicative reasoning (i.e., the ability to identify and use multiplicative / proportional relations between quantities or numbers) is instrumental in a vast variety of situations in everyday life and relevant to many topics in school mathematics and science, including multiplication and division, rational numbers, proportionality, probability, Additive relations have been long deemed more accessible to learners, and a prerequisite for the introduction of multiplicative relations in instruction. However, it has been argued that fostering additive reasoning first, and building multiplicative on additive reasoning (e.g., presenting multiplication as repeated addition) may contribute to learners' difficulties with multiplicative reasoning, including the tendency to reason additively in situations where this is inappropriate. Evidence for early competencies in multiplicative reasoning and indications that appropriate instruction can foster multiplicative reasoning earlier than commonly assumed, challenge traditional views on the development of multiplicative reasoning and on teaching for multiplicative reasoning. These issues are addressed by the papers in this symposium: In the first paper, proportional reasoning abilities of five-to nine-year-old children are investigated, before being exposed to related instruction. The second paper brings new insights on the complex relation between additive and multiplicative reasoning in fourth and fifth graders. The third paper examines how additive and multiplicative reasoning are treated in an early mathematics curriculum. The fourth paper evaluates an intervention designed to improve primary school children's understanding of intensive quantities. The four papers combined enrich understanding of the development of multiplicative reasoning and highlight the important role of instruction.

Quantification in the Greek kindergarten curriculum: Additive Field vs. Multiplicative Field

Presenting Author:Xenia Vamvakoussi, University of Ioannina, Greece; **Co-Author:**Lina Vrakas, University of Ioannina, Greece; **Co-Author:**Maria Kaldrimidou, x, Greece

In this paper we present results of an analysis of the latest Greek kindergarten mathematics curriculum with respect to learning objectives related to quantification. Non-numerical quantification relies on identifying quantities and relations between quantities. Numerical quantification requires in addition the use of numbers as tools to express numerically the magnitude of quantities and their relations. Young children, even infants, are sensitive to quantitative information about discrete as well as continuous quantities, and trace a variety of quantitative relations. However, culture privileges early informal and formal quantification experiences regarding discrete quantity, natural numbers, and additive relations. This asymmetry may hinder further quantitative development. The curriculum that we analyzed pays special attention to early mathematical experiences and, in fact, aims at fostering the development of multiplicative reasoning starting at kindergarten. Our analysis was grounded in the notion of conceptual field referring to a set of concepts and a set of situations from which the concepts derive their meaning. Two conceptual fields, namely the additive and the multiplicative fields have been studied thoroughly in the literature. We categorized the targeted learning objectives of the curriculum as pertaining to the additive or the multiplicative conceptual field, based on the content of the objectives as well as on brief explanations of the objectives and related instructions addressed to teachers, together with exemplary activities. Our analysis indicated that there is still asymmetry in favor of concepts and situations pertaining to the additive conceptual field, privileging discrete quantity, natural numbers, and additive relations.

Early development of proportional reasoning: a cross-sectional study in ages 5 to 9

Presenting Author:Wim Van Dooren, KU Leuven, Belgium; **Co-Author:**Elien Vanluydt, KU LEUVEN, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium

Two important aspects of the development of proportional reasoning remain unclear in the literature: (1) the age range in which it develops and (2) the influence of the nature of the quantities (discrete or continuous) on children's performance. In this study proportional reasoning abilities in five-to nine-year-old children ($n=185$) were investigated, before they received instruction on proportional reasoning. Three proportional reasoning tasks, differing in the nature of quantities (i.e., one with discrete quantities, one with a discrete and a continuous quantity and one with continuous quantities), were used. A Two-step cluster analysis to group children based on qualitative differences in understanding, revealed six different developmental stages and differences in understanding depending on the nature of the quantities involved. We can conclude that the development of proportional reasoning starts at a very early age. Children already take many meaningful steps before they receive instruction on proportional reasoning. However the development is still ongoing when children are in their third year of elementary school. The nature of the used quantities significantly influenced children's performance. More specifically the proportional missing-value tasks we used, became more difficult for children when a continuous quantity was involved.

Unraveling children's preference for additive or multiplicative relations: a reaction times study

Presenting Author:Tine Degrande, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium

Previous research has repeatedly shown that young children erroneously reason additively in multiplicative word problems, whereas older children erroneously reason multiplicatively in additive word problems. Children's erroneous reasoning has recently been explained in terms of their *preference* for multiplicative or additive relations – in addition to lacking multiplicative or additive reasoning abilities. The present study aimed at investigating the nature of this preference, i.e., the extent to which children stick to their preferred answer (*perseverance*) and the extent to which this preference is deliberate (*deliberateness*). 110 fourth and fifth graders who preferred additive or multiplicative relations, as determined by a pre-test, participated in a reaction time experiment in which they were

confronted with additive and multiplicative answers as well as distractors. Their acceptance behavior as well as reaction times for accepting and rejecting those answers were analyzed. Results revealed that preference, and especially multiplicative preference, can be characterized as perseverant and undeliberate, which has implications for the prevention and remediation of preference, and for erroneous reasoning in word problems in general.

Intensive quantities and rational numbers

Presenting Author:Terezinha Nunes, University of Oxford, United Kingdom; **Co-Author:**Peter Bryant, Oxford University, United Kingdom; **Co-Author:**Deborah Evans, Oxford University, United Kingdom; **Co-Author:**Despina Desli, Oxford University, United Kingdom; **Co-Author:**Daniel Bell, Oxford University, United Kingdom

This study evaluated an intervention designed to improve children's understanding of intensive quantities, which are typically challenging for primary school children. Intensive quantities are measured by a ratio between two different extensive quantities. Comparisons between two intensive quantities require attending to this ratio; it is not sufficient to focus on either quantity. For example, two drinks that have the same amount of sugar may not be as sweet as each other because one has more liquid than the other. This paper reports the outcomes of an intervention designed to improve children's understanding of intensive quantities using ratios to talk about the quantities. Four Grade 4 classes (82 children) were randomly assigned either to the intervention or the comparison group. Teachers in the intervention group received a series of 30 problems about intensive quantities to be used during mathematics lessons plus notes to assist them in using ratio language to talk about the problems. Teachers of the comparison group proceeded with 'business as usual'. A pre-test, an immediate post-test and a delayed post-test were implemented. Items in the assessments were not included in the intervention. According to an ANCOVA, the intervention group outperformed the control group in both post-tests (Cohen's *d* effect sizes were 0.54 and 0.49). We conclude that rational numbers can play an important role in supporting children's understanding of intensive quantities. Teaching children about intensive quantities and rational numbers together can be a significant step towards the integration of science and mathematics in the curriculum.

Session H 7

13 August 2019 15:30 - 17:00

Lecture Hall - H09

Symposium

Disentangling children's scientific reasoning skills: what do they know and how do they learn?

Keywords: Inquiry learning, Primary education, Reasoning, Science education

Interest group:

Chairperson: Erika Schlatter, Radboud University, Netherlands

Discussant: Eleni Kyza, Cyprus University of Technology, Cyprus

Scientific reasoning is an important domain-general science skill and has been a longstanding subject of study. As a result of this research we know children are surprisingly capable at scientific reasoning, and that children can improve their scientific reasoning skill through direct instruction or guided discovery. However, it is also known that not all scientific reasoning skills are equally difficult to learn and that not all children develop these skills at the same pace. These differences need to be addressed, particularly in primary education where children of a wide range of ability levels are grouped together. In order to do so precise knowledge about the learning of scientific reasoning is necessary. The current symposium brings together novel research looking at the differences between children's scientific reasoning abilities questions from different angles. The first paper discusses recognition and justification of controlled experiments by kindergartners. The second paper takes a more in-depth look at the control-of-variables strategy in upper primary students, looking at its constituent skills and possible misconceptions. The third paper looks into learning various scientific reasoning skills in authentic, whole-task settings. Relations with other cognitive characteristics and development of reasoning skills over a short educational intervention are discussed. The fourth paper discusses different instructional methods for scientific reasoning. Following the presentations there will be room to discuss the implications of these studies for the future of science education.

Scientific reasoning in primary classrooms: In search of children's need for support.

Presenting Author:Erika Schlatter, Radboud University, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands

Scientific reasoning is an important domain-general skill all children have to learn. However, in the heterogeneous primary school environment children may need different amounts and types of instructional support. In addition, scientific reasoning comprises several skills with regard to the pre-experimental, experimental and post-experimental phases of research, and these are not equally difficult to learn. This study examined the differences in children's scientific reasoning processes during inquiry-based science lessons and their learning outcomes with regard to scientific reasoning after these lessons. The study aimed to identify (1) which scientific reasoning skills should be supported, and (2) whether this need for support depends on children's cognitive characteristics and initial scientific reasoning competences. 134 fifth-graders took a pre- and post-test and participated in five one-hour lessons. Worksheets from the lessons were collected as well as standardized test scores for reading comprehension and mathematics. No improvement was found for the post-experimental skill 'evaluating outcomes', suggesting that all students need additional support to advance this skill. Improvement was found for the pre-experimental skills of 'formulating research questions' and 'experimentation', but this improvement did interact with other cognitive characteristics, suggesting that a portion of the children would benefit from additional support for these skills as well. Worksheet data explain these differences more precisely.

Preschoolers recognize and justify controlled experiments

Presenting Author:April Moeller, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Beate Sodian, Ludwig-Maximilians-Universität (LMU), Germany

Young children's abilities in experimentation, and specifically in controlling variables, have traditionally been viewed as limited. However, research has also shown that task demands may impact performance; for example, primary school children show much greater ability when they have to select a controlled experiment than when they have to spontaneously produce one. In the present study, we investigated preschoolers' ($N = 108$, $M_{ageyoung} = 4;8$, $M_{ageold} = 6;1$, range: 3;5 - 6;9) abilities to select a controlled experiment with novel, knowledge-lean choice tasks using the blicket detector paradigm. Further, we asked children to justify their choices as a more robust measure of their understanding of the Control of Variables Strategy (CVS). The tasks required children to select a "good" test for a hypothesis about the cause of a light effect. Results showed that 50% of children selected the controlled test in at least one of two trials, and 20% selected the controlled test in both trials, more than expected due to chance (11%; $\chi^2(2) = 14.42$, $p < .01$). Forty-five percent of the children who made a correct choice also provided a valid justification (referencing controlling variables), with more older children providing valid justifications than younger children (63% vs 26%; $\chi^2(1, n = 98) = 10.43$, $p < .01$). Preschoolers' ability to recognize controlled tests and older preschoolers' ability to additionally provide justifications for controlled tests, suggest a beginning understanding of control of variables and early scientific reasoning abilities.

Effects of explicit instruction on the acquisition of students' science skills in primary education

Presenting Author:Patricia Kruit, Amsterdam University of Applied Sciences, Netherlands; **Co-Author:**Ron Oostdam, University of Amsterdam, Netherlands; **Co-Author:**Ed van den Berg, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Jaap Schuitema, University of Amsterdam, Netherlands

In most primary science classes, students are taught science skills by way of learning by doing. Research shows that explicit instruction may be more effective. The aim of this study is to investigate the effects of explicit instruction in an inquiry-based learning setting on the acquisition of science skills for students in primary education. Participants included 705 Dutch 5th and 6th graders. Students were randomly assigned to either an explicit instruction condition including an 8-week intervention of explicit instruction on inquiry skills; an implicit condition in which students were taught by learning by doing; or a baseline condition in which students followed their regular science curriculum. To assess the effects, measurement instruments for evaluating the acquisition of science skills were developed. Results of a multi-level analysis indicated that explicit instruction facilitates development of science skills. Therefore, this study provides a strong argument for including an explicit teaching method for developing science skills in primary science education.

Assessment and training of experimentation skills in primary school children

Presenting Author:Sonja Peteranderl, ETH Zurich, Switzerland; **Co-Author:**Anne Deiglmayr, University of Leipzig, Germany; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland; **Co-Author:**Ralph Schumacher, ETH Zurich, Switzerland

This project investigates the training and development of experimentation skills in primary school students. It is embedded in the longitudinal large-scale "Swiss MINT Study". Focus is on the assessment and training of one of the core skills of scientific reasoning, the Control of Variable Strategy (CVS); a strategy to plan, conduct and evaluate conclusive experiments. An experimental study with $n = 669$ students in 38 5th- and 6th-grade classrooms ($Age_{mean} = 11.14$) evaluated the effects of an experimentation skills training on children's understanding and application of CVS. Within classrooms, students were randomly assigned to either the Experimentation Skills Training (EST) or the Active Control Training (ACT). To assess children's competence with regards to CVS, a paper-and-pencil test was developed. This test covers all four subskills of CVS, described in the recent literature: understanding the rationale behind CVS, planning conclusive experiments, identifying non-confounded comparisons, and interpreting evidence gained from non-confounded comparisons. Additionally, the test assesses typical misconceptions in designing conclusive experiments (e.g. testing multiple hypotheses). Open-answer items allow us to assess the argumentation of primary school students. We use an iteratively developed coding system to analyze students' open answers. Data show significantly higher learning gains for the trained students with regards to all four CVS subskills. Furthermore, we could demonstrate a decrease in misconceptions for the trained, but not for the control students. The analysis of the open answers is still in progress and we are confident that these results will shed light on students' reasoning in interpreting experiments.

Session H 8

13 August 2019 15:30 - 17:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Motivational, Social and Affective Processes

Emotional Regulation in Collaborative Learning Environments

Keywords: Collaborative Learning, Emotion and affect, Mixed-method research, Motivation and emotion, Qualitative methods, Quantitative methods, Self-regulation

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Nikki Lobczowski, United States

Organiser: Nikki Lobczowski, United States

Discussant: Susanne Lajoie, McGill University, Canada

Collaborative learning environments offer students opportunities to work alongside their peers in a collective effort to achieve common goals. In these situations, developing social relationships and group cohesion is important, as they can optimize collaborative efforts, foster positive learning outcomes, and increase the likelihood that the students will want to keep working in groups. However, difficulties can arise that thwart cohesive knowledge building. Students often experience both positive and negative emotions during collaborative learning, which can dynamically interact with other students' emotions to create a socioemotional climate that often needs to be regulated. For groups to successfully regulate their emotions during these and other emotionally charged situations, they must understand principles of group-level regulation and enact appropriate strategies. Currently, there is a dearth of literature regarding the regulation strategies students use in collaborative settings and the connections between emotion regulation and other constructs (e.g., motivation). The purpose of this symposium is to present cutting-edge research on emotion regulation in collaborative learning environments. The symposium comprises four presentations, each of which employs different research methods in various contexts to capture both individual- and group-level emotion regulation. These presentations introduce empirical findings of strategies that students identify and/or use to regulate their emotions while working in authentic collaborative settings and how the emotion regulation relates to learning.

Socioemotional Regulation Strategies used in a Project-Based Learning Environment

Presenting Author:Nikki Lobczowski, University of North Carolina at Chapel Hill, United States; **Co-Author:**Kayley Lyons, Monash University, Australia; **Co-Author:**Jeff Greene, University of North Carolina, United States; **Co-Author:**Jacqueline E. McLaughlin, University of North Carolina at Chapel Hill, United States

Students working in small collaborative groups may experience conflicts due to emotional issues at the individual or group level. Students need to regulate these emotions to avoid or reduce negative socioemotional interactions that can interfere with group performance. In this article, we studied the socioemotional regulation strategies used by graduate students as they worked together in a small-group project-based learning environment. For this, we observed groups of students in an authentic learning context, video recording them during group meetings as they worked on a large class project. We conducted a qualitative extreme case study of three groups who, over a six-week period, rated their emotions as low, medium, and high to determine how the groups regulated their emotions and the similarities and differences between the groups. We found that strategies varied by targeted stimulus and emotional responses, levels of regulation, regulation processes, the domain of the strategy, and strategy type. Also, we found few differences in the groups' socioemotional regulation, but that the groups' reactions to stimulus events and subsequent emotional regulation seemed to influence the off-task behavior of the group, suggesting the emotions can either aid or hinder group functioning. Understanding what strategies are helpful in specific collaborative contexts can help educators guide groups of students to regulate their emotions.

Solo and Group Strategies for Regulating Positive and Negative Emotions During Online Collaboration

Presenting Author:Sarah Greco, University of Victoria, Canada; **Presenting Author:**Allyson Hadwin, University of Victoria, Canada; **Co-Author:**Elizabeth Webster, University of Victoria, Canada

This study examined self-reported solo and group strategies for regulating positive and negative emotions during an online collaborative task. Participants were 177 students enrolled in an undergraduate learning-to-learn course. Students worked in groups of three to five to complete two online collaborative problem-solving tasks. In an individual reflection completed after the collaborative task, students (a) described what they individually did (solo strategy) and what their groups did (group strategy) when they experienced a positive or negative emotion during the task and (b) evaluated the effectiveness of the strategies. Findings suggest that students and groups use a variety of strategies for regulating both positive and negative emotions, with a tendency to use certain strategies more frequently overall and depending on the emotion (positive or negative). Students perceived the majority of strategies as helpful for regulating their emotions, but analyses of the effect on progress indicate some strategies may be more beneficial than others. Future research could therefore examine interventions for emotion regulation in collaboration that focus on encouraging students to enact these more effective strategies.

How does group level emotion regulation in collaborative learning change the way group members feel?

Presenting Author:Kristiina Kurki, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:**Tiina Törmänen, University of Oulu, Finland

Socio-emotional interactions are a part of collaboration process where group members build motivational ground and emotional atmosphere for learning together. Research indicates that to adjust motivation and emotional atmosphere within the group, group members engage in group level regulation of motivation and emotions. However, little is known about how these group level regulation processes further contribute to group members' emotional state and experiences of collaboration. This research aims to explore how the students activate group level regulation of emotions and motivation during negative socio-emotional interactions, what types of strategies they use and how group level regulation makes a difference to the students' emotional state and experiences of collaboration. Participants are 12-year old primary school students ($N = 37$) working on a science task in small groups. Groups' collaborative working was videotaped and group members assessed their emotional state before and after the task. The group members' experiences of collaboration were assessed after the task. In the analysis, groups' negative socio-emotional interactions were first located. Next, related group level motivation and emotion regulation were

detected and specific strategies were coded. The analysis proceeded by exploring how group level regulation in negative interactions were related to individual group members' perceived emotional state and their experiences of collaboration. The results indicate that group members activate various strategies for group level regulation of motivation and emotions and that individual group members' negative emotional state increase group level regulatory activities. Regulatory activities, in turn, influence positively on the group members' experiences of collaboration.

The Interrelation between Shared Emotion and Regulation for Group Intellectual Progress

Presenting Author:Toni Rogat, Purdue University, United States; **Co-Author:**Britte Cheng, SRI International, United States; **Co-Author:**Temitope Adeoye, Purdue University, United States; **Co-Author:**Andrea Gomoll, Indiana University, United States; **Co-Author:**Anne Traynor, Purdue University, United States; **Co-Author:**Patrik Lundh, SRI International, United States; **Co-Author:**Cindy Hmelo-Silver, Indiana University, United States

Groups face socio-emotional challenges as students work to coordinate their distinct perspectives (cognitive) and interpersonal dynamics (relational). In this study, we investigate how group's shared positive or negative emotions are interrelated with group metacognitive engagement, conceptualized as socially shared regulation, in ways that foster or inhibit productive disciplinary engagement. Participants were middle schoolers collaborating in heterogeneous groups of 3 or 4 (N = 25 groups) during reform-based curriculum unit tasks involving authentic disciplinary activity. Group emotions and regulation were evaluated using quality ratings assigned every five minutes of video-taped interactions. We identified four patterns showcasing the interrelation of shared affect with metacognitive regulation (e.g., Pattern 2 - shared activated negative affect (frustration) provoked high-quality metacognitive engagement). Our qualitative analysis elucidated the sustained and multiple content targets of regulation employed to respond to group's shared affect. Here, to be productive, groups drew from regulatory strategies inclusive of behavioral, group process, and task regulation, to then be able to shift toward regulating understanding and ultimately intellectual progress. We also identified a beneficial reciprocal role of affect for maintaining group engagement during challenging cognitive and interpersonal activity. Understanding how groups effectively negotiate these challenges can inform scaffolds and practices aimed at supporting collaborative activity.

Session H 9

13 August 2019 15:30 - 17:00
Lecture Hall - H06 - Amazon Hörsaal
Symposium
Teaching and Teacher Education

Beyond Judgment Accuracy: Understanding Teachers' Cognitive Processes in Diagnostic Judgments

Keywords: Assessment methods and tools, Cognitive skills, Experimental studies, In-service teacher education, Learning analytics, Mathematics, Metacognition, Pre-service teacher education, Quantitative methods, Reading comprehension, Secondary education, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Katharina Loibl, University of Education Freiburg, Germany

Discussant: Lieven Verschaffel, KU LEUVEN, Belgium

The quality of teachers' diagnostic judgments of several aspects of the learning environment (e.g., the understanding of single students or a class, the quality of solutions or the difficulty of a task) is crucial for adaptive teaching. Yet, teachers often struggle in making accurate judgments. Much research on teachers' diagnostic competence relies on correlational analyses of relations between the judgement accuracy and characteristics of the teacher or the situation. However, recently a stronger interest in understanding the cognitive processes involved in the genesis of diagnostic judgments has emerged. A better understanding of the cognitive processes enables us not only to expand the knowledge base of judgment processes, but also to design effective interventions to promote teachers' diagnostic judgment skills. All studies presented in this symposium build upon models of information processes as a basis to investigate the cognitive processes involved in the genesis of diagnostic judgments. Within this framing, the studies test assumptions on the judgement processes by (a) systematically designing and varying the characteristics of the diagnostic situation (e.g., by including certain perceivable cues; study 2) and manipulating the teachers' knowledge (study 1 and 2), by (b) including systematically varied moderators (e.g., time pressure; study 2), and by (c) measuring diverse indicators of information used in the judgment process (e.g., process data, cue-utilization; studies 3 and 4). Taken together, these studies allow conclusions with regard to the suitability of the information processing account and their results pave the floor for a discussion towards a cognitive model of diagnostic judgments.

Teachers' use of specific and unspecific knowledge in judging task difficulties

Presenting Author:Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Andreas Ostermann, University of Education Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany

Research has shown that teachers considerably differ in their accuracy when they judge students' traits or task characteristics and that there are multiple influences on judgment accuracy. In order to shed light on the reasons behind these mostly correlational findings, we used an information processing model for diagnostic judgments. Inspired by Nickerson's model of experts' knowledge about other people, we focused on the impact of specific and unspecific teacher knowledge on the judgment of task difficulties. More precisely, we distinguished between teachers' knowledge about students' general achievement level within the topic of mathematical functions as unspecific knowledge component and teachers' knowledge about specific difficulties generated by certain features of tasks (i.e., PCK in the area of functions) as specific knowledge component. While both knowledge components lead teachers to expect higher absolute difficulties of tasks, only specific knowledge can have an impact on the judgement of the relative difficulties of different tasks. We experimentally tested this assumption by implementing three conditions: Teacher students received (1) no training, (2) information on the phenomenon of experts' tendency to underestimate the difficulty of tasks (i.e., unspecific knowledge), or (3) information regarding PCK on functions (i.e., specific knowledge). The effect of the three conditions was as expected: Both training conditions rated the absolute difficulties of the tasks as higher than the no training condition, but only the PCK condition reached a higher rank order accuracy in judging the tasks. These results, thus, support the validity of our cognitive interpretation of the judgement process.

Processing surface and deep features when judging task difficulty: Effects of PCK and time pressure

Presenting Author:Andreas Rieu, PH Freiburg, Germany; **Co-Author:**Katharina Loibl, University of Education Freiburg, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Stephanie Herppich, DLR Project Management Agency, Germany

Teachers have to recognize features that determine the difficulty of mathematical tasks to adapt the instruction to their students' skills. In the domain of fractions, these features are located on the surface and in the depth of the task and can be regarded as cues for the task difficulty. Generally, the choice of an adequate task takes place in two distinct situations: the reflected preparation (i.e., without time pressure) or "on the fly" during the lesson (i.e., with time pressure). In the present study, we examined the cognitive processes behind these decisions with and without time pressure. We further investigated the impact of pedagogical content knowledge (PCK) on these processes. Therefore, the participating prospective teachers were divided into two groups: an intervention group and a control group. The intervention group received instruction about task difficulty and the cues related to it (i.e., PCK). During the simulation of the two decision situations (i.e., with and without time pressure), the participants had to choose the more difficult task between pairs of fraction tasks. The answers allowed drawing conclusions about the perception and the weighting of cues in each group with and without time pressure. The results show that PCK improved the perception and the weighting of cues during the decision process. Furthermore, time pressure had negative effects on the quality of the decisions.

Using Social Network Analysis to analyse Judgement Process Data from a Simulated Classroom

Presenting Author:Matthias Mückshoff, Otto-Friedrich-Universität Bamberg, Germany; **Co-Author:**Tobias Rausch, University of Bamberg, Germany; **Co-Author:**Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany

Accuracy of teacher judgments is found to vary substantially across teachers. Behavioural data on teachers' judgement processes can provide deeper insight into the reasons for this variation. The present study investigates the processes when judging students' achievement in a simulated classroom. Methods from Social Network Analysis are used to analyse transition networks based on process data from the simulated classroom environment. Each node in the transition

networks represents one item that is being assigned to one student. The sample consists of 37 German secondary school teachers. Results show that participants with very accurate judgements about students' competencies focus on one item at a time before they move on to the next item. They further show a tendency towards using items of medium difficulty. Participants with less accurate judgements in the simulated classroom show hardly any identifiable patterns of assessing students' competencies. The results are discussed with regard to the judgement formation process as well as the limitations due to the influence of the simulated classroom design.

Teachers' cue-utilization affects their monitoring accuracy of students' reading comprehension

Presenting Author:Janneke van de Pol, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Keith Thiede, Boise State University, United States

Teachers must accurately monitor students' learning to effectively adapt instruction. According to the cue-utilization framework, judgment accuracy is determined by the cues people use to judge performance. Accuracy improves when people use cues that are highly diagnostic of performance of the outcome measure. Yet, we know little about what cues teachers use to judge student learning. This study addressed this issue. Forty-six secondary education teachers predicted their students' (N=272) reading comprehension scores. On a cue-list, they indicated which cues they used. To provide teachers with access to cues related to students' comprehension (i.e., knowledge cues), students were instructed to generate drawings of the causal relations in the texts after reading the texts, which teachers had access to while predicting test performance. Teachers also knew the students' identity, so teachers had access to student cues. Finally, teachers saw the texts, so they had access to task cues. As knowledge cues are more diagnostic of test performance than student cues and task cues, we expected judgment accuracy to be greater when teachers used knowledge cues than for when teachers used other cues. Indeed, a multilevel analysis showed that using knowledge cues (e.g., omissions in students' diagrams) fostered teachers' judgment accuracy (i.e., absolute deviation from student test scores), whereas using student cues (e.g., students' IQ) resulted in underestimation/overestimation of students' understanding. This study extends the applicability of the cue-utilization framework to teacher judgments and suggests the importance of examining cue-utilization in developing interventions to improve teachers' monitoring accuracy.

Session H 10

13 August 2019 15:30 - 17:00

Seminar Room - S06

Roundtable

Higher Education

Higher Education

Keywords: Educational Psychology, Goal orientation, Higher education, Informal learning, Learning approaches, Self-efficacy, Teaching approaches, Teaching/instruction, Video analysis, Workplace learning

Interest group: SIG 04 - Higher Education, SIG 14 - Learning and Professional Development

Chairperson: Josephine Moate, University of Jyväskylä, Finland

Classroom observation of teacher-focused teaching: The student perspective

Keywords: Higher education, Teaching approaches, Teaching/instruction, Video analysis

Presenting Author:Christine Johannes, University of Erfurt, Germany

Despite of their distrust in student evaluations of teaching (SET), lecturers value peer feedback for their teaching if observers take a student perspective. Based on these considerations, student ratings of teaching action might offer a beneficial addition to the common evaluation methods, if issues of measurement quality are resolved. To assess the reliability of low inference student ratings of teacher-focused teaching action, the study compares convergence of student ratings regarding the presentation of guiding questions, structuring, learning goals, practical relevance, examination contents and summaries in a video-based rating. In a 3 (beginning vs. advanced vs. trained students) x 2 (dichotomous rating vs. Likert scale) design undergraduate students (N = 120) will rate video-clips with a duration of three to five minutes in length. Up to now, the data collection is not fully completed. Preliminary results of a pilot study (N = 45) showed no differences of rating quality with respect to student expertise. Above that, students recognized examination contents in a convergent way. Conversely, the ratings of structuring and summaries reached only limited concordance, whereas the ratings of guiding questions, learning goals, practical relevance did lead to any convergence. Depending on the final results, the applicability for student observation of teaching action, e.g. as an addition for SET measures or for a student feedback system will be discussed.

Lecturers' achievement goals as predictors for the processing and use of student feedback

Keywords: Goal orientation, Higher education, Informal learning, Workplace learning

Presenting Author:Julia Hein, University of Mannheim, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Raven Rinas, University of Augsburg, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Oliver Dickhaeuser, University of Mannheim, Germany

Given that the academic success of students is dependent upon their lecturers' didactical competencies and expert knowledge, it is important to know which factors facilitate and improve professional learning and, thereby, the competence and knowledge gains of instructors. Receiving students' feedback on the teaching quality is an important informal learning opportunity for the academic staff. However, previous research has shown that merely receiving results of teaching evaluations will not lead to improvement of the teaching quality. Teaching evaluations can contribute to the quality of teaching only if it is processed by the lecturers and used for improvement of teaching. According to models of self-regulated learning and achievement goal theory, motivational goals can be assumed to influence self-regulated learning behavior. Therefore, we investigate achievement goals as predictors of the processing and use of student feedback. According to previous research, learning goals (the pursuit to enhance one's competencies) especially should predict the usage of learning opportunities. We propose that learning goals are positively associated with quantitative learning behavior (the time spent processing their teaching evaluation feedback, intent to act on it, and the number of concrete intentions) because learning goals enhance deeper learning. Performance goals are assumed to influence lecturers' comparison behavior. In a selection paradigm we will investigate, how achievement goals influence lecturers' behavior in the feedback situation. Therefore, we will conduct a multi-method longitudinal study and question around 200 lecturers. First results of this study will be discussed.

Psychological flexibility and its relation to learning processes

Keywords: Educational Psychology, Higher education, Learning approaches, Self-efficacy

Presenting Author:Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Nina Katajaviuri, University of Helsinki, Finland

Psychological flexibility has shown to have a significant effect on students' achievement, but it has not been fully explored in the university context. The purpose of this study is to examine the relationship between students' psychological flexibility, self-efficacy beliefs and approaches to learning. A total of 69 first-year pharmacy students participated in this study. Students approaches to learning (HowULearn), self-efficacy beliefs (MSLQ) and psychological flexibility (WAAQ) was measured as well as their achievement in studies. The preliminary results show that surface approach to learning is most strongly and negatively related to psychological flexibility. In addition, psychological flexibility was related to both study success and study progression. The results indicate that students' well-being is related to their learning processes and also student achievement.

Session H 11

13 August 2019 15:30 - 17:00

Seminar Room - S12

Roundtable

Motivational, Social and Affective Processes

Motivation and Emotion in Student Learning

Keywords: At-risk students, Emotion and affect, Experimental studies, Higher education, Learning and developmental difficulties, Motivation, Qualitative methods, Self-regulation, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Bobby Hoffman, University of Central Florida, United States

Exploring inhibiting and facilitating factors for academic achievement of gifted students

Keywords: Motivation, Qualitative methods, Self-regulation, Student learning

Presenting Author: Katelijne Barbier, University of Antwerp, Belgium; **Co-Author:** Vincent Donche, University of Antwerp, Belgium; **Co-Author:** Karine Verschueren, KU Leuven, Belgium

In the last decade, the Achievement Orientation Model of Siegle and McCoach (2005) has often been used to quantitatively explore different pathways for academic achievement among gifted students in educational settings. In this qualitative study using in-depth interviews of 6 gifted students (3 well-performing and 3 underperforming students) from two different schools, we further examined the inhibiting and facilitating factors associated with academic achievement. The qualitative results detail on the explanatory role of factors at the school level, the classroom level, and the individual learner level such as self-regulatory capacities as well as the time or phase students are in the school career. The qualitative results underline the value of the Achievement Orientation Model, but also stress the importance of taking learner perceptions into account, and point at important avenues for further research.

Stressed from the beginning – How to handle the impact of written exams on primary school students

Keywords: Emotion and affect, Experimental studies, Learning and developmental difficulties, Self-regulation

Presenting Author: Olga Rapoport, Universität Koblenz-Landau, Germany; **Co-Author:** Sarah Kahl, University of Koblenz and Landau, Germany; **Co-Author:** Eva Neidhardt, Universität Koblenz-Landau, Campus Koblenz, Germany

The aim of our project is to show the impact of evaluative threat on the stress level of school children during exam and to depict the reduction of the stress level due to a skills training. We designed two experimental studies. In a first study, we measured the stress response in evaluative threat situations. Therefore, we determined the stress level in primary school children on an exam day using salivary samples and compared it to the stress level on an exam free day. In a second study, we are going to apply a skills training to secondary school children and show the impact of the training by comparing the cortisol level of the experimental group to the control group at two measurement times. The studies could help to evolve an appropriate training for children of different age groups to help them handle evaluative threat.

Students brooding over exams. Measuring post-event processing in test anxiety with new methods.

Keywords: At-risk students, Emotion and affect, Higher education, Learning and developmental difficulties

Presenting Author: Sarah Kahl, University of Koblenz and Landau, Germany; **Co-Author:** Olga Rapoport, Universität Koblenz-Landau, Germany; **Co-Author:** Eva Neidhardt, Universität Koblenz-Landau, Campus Koblenz, Germany

Post-event processing (PEP) plays a crucial role in the maintenance of social anxiety disorder. Due to similarities, we investigate whether PEP is important in test anxiety, as well. Two studies we conducted to date showed significant correlations between trait and state test anxiety and PEP after a given exam, which indicates that PEP does occur in test anxious individuals. Nevertheless, there were some inconsistencies in the results of the two studies. These were probably due to different time distances between the measuring times but nevertheless raise new questions. To further investigate how PEP takes place after an exam, we want to apply a diary-based approach using a smartphone-app. Trait and state test anxiety are going to be measured prior to an exam, PEP at different times afterwards. Using the app should help to increase the compliance of the participants and to get more detailed findings about PEP in the field. Some questions and difficulties concerning the study still need to be addressed.

Session H 12

13 August 2019 15:30 - 17:00

Seminar Room - S03

Roundtable

Learning and Social Interaction, Teaching and Teacher Education

Teacher Professional Development

Keywords: Case studies, Collaborative Learning, Communities of practice, Game-based learning, In-service teacher education, Motivation, Pre-service teacher education, Reading comprehension, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Iwan Wopereis, Open University of the Netherlands, Netherlands

Proximity and Learning in Inter-organizational Collaboration for Inclusive Educational Settings

Keywords: Case studies, Collaborative Learning, Communities of practice, Teacher professional development

Presenting Author: Jantien Gerdes, Vrije Universiteit Amsterdam, Netherlands

Proximity and Learning in Inter-organizational Collaboration for Inclusive Educational Settings With the implementation of inclusive education, schools are faced with new challenges concerning student support, calling for educational services and child support services to pool their strengths. Often, interventions targeted at the enhancement of collaboration involve the co-location of education and services in the same building. It is not clear, though, how and under what circumstances co-location of schools and child support services leads to professional learning and transformation of practice. In this study, an initial template was used to excavate the interrelated components of collaboration in a multiple case study on inter-organizational collaboration in three Dutch schools for secondary education. Data were collected by means of individual semi-structured interviews for professionals working within the care structure and focus group interviews for class teachers. The interview data were analysed using Template Analysis.

Design principles for a professional development program on promoting students' reading motivation

Keywords: Motivation, Reading comprehension, Teacher professional development, Teaching/instruction

Presenting Author: Iris Vansteelandt, AP University College/Ghent University, Belgium; **Co-Author:** Suzanne Mol, Leiden University, Netherlands; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

Studies show that teachers' continuous professional development (CPD) is essential for educational quality. Moreover, when it comes to reading, CPD is key for students' success in education and participation in our 21st century society. Most of the research investigating professional development programs on improving teachers' self-efficacy for teaching reading and on fostering students' reading motivation in particular, however, fails to include clear and detailed descriptions of the design principles underlying the programs. Therefore, the present study provides a comprehensive description and operationalization of the design principles underlying a CPD program for primary school teachers regarding promoting students' reading motivation. More particularly, the CPD combines Desimone's (2009) framework for effective professional development with Self-Determination Theory (SDT) (Ryan & Deci, 2000). Consequently, the in the CPD included core features distinguished by Desimone (2009) (i.e., content focus, coherence, active learning, collective participation and duration) and the need for autonomy, competence and relatedness as put central in SDT (Ryan & Deci, 2000) are analytically described and elaborated on. In view of reporting on the implementation check of the CPD, we further provide insight into whether these operationalized design principles were also perceived as such by the teachers participating in the CPD intervention.

Themes for Advancing Research and Practice on Teacher Education for Using Games for Learning

Keywords: Game-based learning, In-service teacher education, Pre-service teacher education, Teacher professional development

Presenting Author: Mamta Shah, Drexel University, United States; **Co-Author:** Aroutis Foster, Drexel University, United States

In this analytical paper, we argue for the centrality of teachers in game-based learning (GBL) interventions. We highlight the timeliness of pursuing research in this area and illustrate emergent literature. We dive into the evidence generated over more than a decade to identify six principles that can guide research and practice in teacher education for GBL. These principles include: Teachers play an active role in GBL environments; Games are a form of curriculum; GBL is a way of facilitating learning; Games are not contextually or pedagogically neutral; Teachers' knowledge of GBL evolves over time; and Teachers' professional identities impact GBL practice. The principles can serve as a starting point for restructuring teacher education programs for facilitating teachers' knowledge and motivation, experiences, and competence in incorporating games for enhancing their practice and student learning. As researchers in competing and complementary fields, it is imperative to continue examining games and learning as well as processes that involve the developing and testing of analytical and pedagogical approaches that inform how teachers' practices are supported during pre-service and in-service years. It is imperative to continue to learn from successful games and learning studies, learn from experiences of teachers, researchers, and designers, and provide sound practices to support instructional models that may be beneficial for teacher education programs. Establishing evidence of the positive educational outcomes that result from using GBL strategies in the curriculum could potentially breakdown many of the barriers classroom teachers encounter when introduced to a novel technological pedagogical innovation.

Session H 13

13 August 2019 15:30 - 17:00

Seminar Room - S16

Roundtable

Learning and Instructional Technology

Technology-Enhanced Learning and Instruction

Keywords: Content analysis, Design based research, Educational technology, Game-based learning, Literacy, Mixed-method research, Science education, Secondary education, Special education, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Mandy Hommel, TU Dresden, Germany

Much.Matter.in.Motion: Learning Science through Constructing Computational Models of Complex Systems

Keywords: Design based research, Educational technology, Mixed-method research, Science education

Presenting Author: Janan Saba, University of Haifa, Israel

The paper presents a study into students' learning of science through constructing computational models of complex systems with the new Much.Matter.in.Motion platform (MMM; Levy, Saba, et al., 2018). MMM's design highlights the epistemological structure of agent-based modeling: defining entities, their properties, actions and interactions with each other and with macro-level boundaries and fields. The study was conducted with six 7th-grade students and focused on the conceptual learning of the topic of gases with the MMM environment; reasoning about complex systems; and on the use of the platform's affordances, using questionnaires, interviews, and screen-captures. Results show a significant rise in the overall scores; though mainly for the micro-level science concepts. Interviews' analysis showed greater changes in the texture of the students' explanations: shifting from static to dynamic descriptions, compounding different steps, used more science concepts more correctly, and relating the micro-level rules to the macro-level patterns. Three of the modeling platform's affordances were used in an activity's screen-capture movies: Macro-level objects are painted in, to remove the need of programming these objects. The use of numerical measurements at initial stages is minimized in service of supporting the observation of the complex phenomena itself. Ease in changing the model, to encourage the shifts between successive models.

The effect of speech technology on literacy development

Keywords: Literacy, Secondary education, Special education, Technology

Presenting Author: Marianne Engen Matre, University of Agder, Norway

The STEL project (Speech Technology's Effect on Literacy) will measure the effect of using speech technology to improve writing and reading skills among Norwegian 8th to 10th grade students struggling with literacy development. Speech technology consists of speech-based writing and reading through speech synthesis. Due to recent technological advances software for speech-based writing and speech synthesis is now available to all students. The tools are integrated into readily available and widely used computer and tablet software (e.g., Microsoft Word, Google Documents, or IntoWords). The aim of the study is to investigate the impact of digital literacy resources on different areas of lower secondary students' reading and writing development. The project will employ a quasi-experimental design in which students who performed in the lowest 20th percentile of the national test of reading in their first year will comprise the sample. This study will contribute to research on compensatory use of speech technology by aiming to discover which aspects of literacy development might be affected by introducing dictation and speech synthesis. The first hypothesis suggests that speech technology might target specific areas of literacy development such as reading comprehension, reading and writing fluency, and increase quality of written texts. The second hypothesis considers the compensatory effect of increased access to the written medium.

Digital games in the context of financial literacy education: An instructional content analysis

Keywords: Content analysis, Design based research, Game-based learning, Technology

Presenting Author: Julia Schultheis, University of Mannheim, Germany; **Co-Author:** Carmela Aprea, University of Mannheim, Germany

Due to socio-economic trends, financial literacy (i.e., the ability to reasonably deal with money and financial matters) is essential for every person. Consequently, the promotion and assessment of financial literacy are key concerns for instructional research. However, meta-analyses showed that financial literacy education programs are not as effective as they should be due to their lack of behavioural and motivational aspects of financial decision making. Digital games are expected to overcome these limitations due to their nature of simulating these processes and fostering intrinsic motivation. As their potential is widely acknowledged, numerous games have been developed, but there is a lack of evidence regarding the instructional quality of those games. The research presented in this paper contributes to filling this gap, by reporting the results of an analysis of the instructional content which is covered by available financial literacy games. Two research questions are addressed: (1) Which content facets of financial literacy are covered in financial literacy games? (2) Which types of knowledge are represented in those games? To answer these questions, we identified relevant games and analysed these games with regard to the financial literacy facets and the represented types of knowledge. The results show that the facets "Spending money", "Saving money" and "Earning money" are mostly addressed.

Session H 14

13 August 2019 15:30 - 17:00

Seminar Room - S14

Roundtable

Assessment and Evaluation, Cognitive Science, Motivational, Social and Affective Processes

Learning Analytics and Metacognition

Keywords: Assessment methods and tools, E-learning/ Online learning, Early childhood education, Higher education, Learning analytics, Metacognition,

Motivation, Self-regulation

Interest group: SIG 01 - Assessment and Evaluation, SIG 16 - Metacognition

Chairperson: Inken Gast, Maastricht University, Netherlands

Mining Instructors' Self-Regulated Learning in the Context of Using a Learning Analytics Dashboard

Keywords: E-learning/ Online learning, Learning analytics, Metacognition, Self-regulation

Presenting Author: Lingyun Huang, McGill University, Canada; **Co-Author:** Juan Zheng, McGill University, Canada; **Co-Author:** Yuxin Chen, Indiana University, United States; **Co-Author:** Cindy Hmelo-Silver, Indiana University, United States; **Co-Author:** Susanne Lajoie, McGill University, Canada

Instructors use their mental models of how students learn when interpreting student actions that occur online. This study explores how teachers' mental models are used in the context of using a learning analytics (LA) dashboard in the context of an online learning environment. Instructors' mental models would likely guide them in seeking critical information from the dashboard, interpreting student actions and identifying students' learning and interaction. This study maps such mental models onto self-regulated learning (SRL) theory, associating an instructor's thoughts with a series of time-ordered SRL events. We postulate a process pattern may exist indicating an instructors' engagement in metacognitive events (i.e. orientation, planning, goal setting, monitoring, and evaluation) and cognitive events (i.e. repeating, summarizing, and elaboration), as well as revealing how an instructor makes sound pedagogical decisions by leveraging an LA dashboard. To uncover the pattern, process mining technique was implemented on SRL events which were obtained by qualitatively analyzing instructors' think-aloud protocols. The results indicated that instructors used a variety of SRL events. They were mostly engaged in monitoring and evaluation events, which enables them to gain a deeper understanding of the LA dashboard and use the acquired information to elaborate on the progress of student learning and collaboration. These patterns are in line with the SRL theory assumption that SRL mediates instructors' efforts to process more complex information. In particular, SRL supports instructors use of a learning analytics dashboard to foster a deeper understanding of student characteristics, learning progress, and the group environment.

Metacognitive development and associations to executive function and motivation in problem-solving

Keywords: Early childhood education, Metacognition, Motivation, Self-regulation

Presenting Author: Loren Marulis, Connecticut College, United States; **Co-Author:** Lindsey Nelson, Indiana University, United States

Metacognition—the knowledge, monitoring, and regulation of cognition—is key to cognitive development, learning, and academic achievement though empirical examinations in early childhood are limited. The goal of the current study was to investigate the development of early metacognition through the use of two contextualized, developmentally appropriate measures, and examine associations to other early developing skills linked to learning and academic achievement: executive function, and motivation. Participants were 77 preschoolers, ages 3-5, in a college lab school. Metacognition was measured using a metacognitive knowledge interview and a metacognitive behavior observational coding protocol; both assessed in conjunction with a puzzle problem-solving task. Executive function was assessed using the Head Toes Knees Shoulder measure, and motivation was operationalized as persistence on the puzzle. Associations between early metacognition, executive function, and motivation were examined. Children as young as 3 years exhibited metacognitive skills (knowledge, monitoring, and regulation of cognition) and all preschoolers displayed indicators of metacognition. The two measures of metacognition were significantly and positively related at a moderate level; there was unique variance and individual differences. Significant positive relations were also found between both measures of metacognition and executive function, and motivation. Metacognition significantly and positively predicted executive function and motivation. Results contribute in important ways to psychological and educational theory by reinforcing recent literature that suggests metacognition develops far young than was originally thought, providing models for assessing these skills in young children, and explicating relations between metacognition, EF, and motivation in early development.

Investigating and improving students' feedback literacy using trace data for writing assignments

Keywords: Assessment methods and tools, Higher education, Learning analytics, Self-regulation

Presenting Author: Clara Schumacher, University of Mannheim, Germany; **Presenting Author:** Joanna Tai, Deakin University, Australia; **Co-Author:** David Boud, University of Technology Sydney/ Deakin University, Australia; **Co-Author:** Dirk Ifenthaler, University of Mannheim, Germany

Learning in higher education demands learners to self-regulate. To adjust learning processes learners are required to monitor their learning activities and outcomes. For novice learners, external feedback can offer the additional support needed. However, to process and integrate external feedback "feedback literacy" is vital. Both feedback processes and developing feedback literacy may be problematic in the contexts of scale and efficiency in higher education. To combat both issues, this project aims to investigate the effects of offering semi-automated feedback on writing assignments to foster student's feedback literacy. In a pilot study, students' perceptions on automated feedback will be investigated. In an experimental study, participants will interact with different types of feedback and their reactions will be investigated using trace data. By integrating learner characteristics participants will receive personalised support. Later on, peer-feedback functionalities will be added to the system and its relative value will be investigated, compared to the automated feedback. This system may offer a potential solution to both improving feedback processes and developing students' feedback literacy.

Session H 15

13 August 2019 15:30 - 17:00

Seminar Room - S05

Roundtable

Higher Education, Motivational, Social and Affective Processes

Higher Education

Keywords: At-risk students, Attitudes and beliefs, Conceptual change, Emotion and affect, Higher education, Misconceptions, Out-of-school learning, Problem-based learning, Professions and applied sciences, Quantitative methods, Social interaction

Interest group: SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Kerstin Helker, RWTH Aachen University, Germany

Expectations and Assessment Standards of Community Partners in Service-Learning Projects

Keywords: Higher education, Out-of-school learning, Problem-based learning, Social interaction

Presenting Author: Maren Schlegler, Frankfurt University of Applied Sciences, Germany; **Co-Author:** Kemal Tursun, Frankfurt University of Applied Sciences, Germany; **Co-Author:** Susanne Koch, Frankfurt University of Applied Sciences, Germany; **Co-Author:** Sebastian Reis, Frankfurt University of Applied Sciences, Germany; **Co-Author:** Lukas Platt, Frankfurt University of Applied Sciences, Germany

In times of media reports about isolation, xenophobia and egoism, social commitment is an important and indispensable driver for a just, respectful and good coexistence of all people. Service-Learning is a solution for promoting voluntary work among students and empowering students to assume social responsibility. In Service-Learning classes students use their knowledge to perform service in the community and to address the community's needs. Multiple studies about students' perspectives and the influence of Service-Learning on students' personality exist. In contrast, studies on the community partners' perspective, especially in Higher Education, are scarce. The aim of our study is therefore to analyze the community partners' perspectives in Service-Learning projects in Higher Education. The study consists of three steps: (1) Systematic literature review, (2) guided interviews with community partners and (3) development of a quantitative scale to conduct a study with a larger sample. The systematic literature review shows that only a small number of articles can be found. In the interviews, community partners share different expectations. One community partner hopes to save time for their employees while another one is looking for a new perspective on their organization. Service-Learning is always collaboration between teachers, students and community partners. Therefore, each perspective of the individual partners is important for the project and its outcome. This study is intended to supplement the previous study situation decisively, as the focus is on the partners and their expectations and assessments of the results.

Challenges involved in a latent variable analysis within a study of LGBTQ+ students' resilience

Keywords: At-risk students, Attitudes and beliefs, Emotion and affect, Quantitative methods

Presenting Author:Charlotte Allen, University of Cambridge, United Kingdom

The present research is a mixed methods longitudinal study exploring the multilevel dynamic processes facilitating resilience in LGBTQ+ students in response to commonplace school challenges. Survey questionnaires were conducted at three time points with over 700 students in year 10 and 11, across 4 schools in the East of England. Numerous 'latent' constructs, such as self-esteem, perceived social support, and emotional and action responses to academic challenges were probed within the questionnaires. One research aim is to explore how these latent variables relate to one another over time. The proposed roundtable session would involve exploring the complex decision making involved in choosing and running a latent structure analysis, including reflecting upon the nature of the observed and latent variables and assumptions involved in the analysis. Additionally, emergent findings will be discussed.

Pharmacy students' prior knowledge and epistemic cognition at the beginning of university studies

Keywords: Conceptual change, Higher education, Misconceptions, Professions and applied sciences

Presenting Author:Ilona Södervik, University of Helsinki, Finland; **Co-Author:**Nina Katajauori, University of Helsinki, Finland; **Co-Author:**Leena Hanski, University of Helsinki, Finland

A common instructional challenge in European universities is the heterogeneity of students in terms of their background, particularly in introductory courses. Many students have alternative conceptions and robust misinterpretation related to the contents to be studied. Students' epistemic cognition plays a role in their reasoning of domain-specific conceptual knowledge, because it changes the premises on which their knowing is based. However, there is still relatively little knowledge about domain-specific conceptual learning and epistemological development in the development of expertise in higher education. Therefore, this study starts a series of follow-up studies, in which pharmacy students' conceptual understanding together with conceptual change, reasoning skills related to a patient case task and epistemic cognition, will be investigated in a longitudinal study. In this study, first-year pharmacy students' (N = 129) prior knowledge on biosciences was measured in the beginning of the studies with 13 multiple choice questions and a case task including three open-ended questions. Students received approximately 6.7 scores from the MCQs revealing knowledge gaps and misconceptions in elementary school and high school level questions. Students were relatively successful in identifying and explaining the most obvious concepts related to a case task, such as antibiotics, but concepts such as probiot or normal microbiota posed more challenges. Reasoning skills related to the patient case task varied a lot. Lastly, students' answers to the task related to epistemic cognition could be divided into categories of naïve, scientific and synthetic. Statistical comparisons between variables will be accomplished and pedagogical implications discussed.

Session H 16

13 August 2019 15:30 - 17:00

Seminar Room - S02

Roundtable

Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Attitudes and beliefs, Conceptual change, Developmental processes, Educational technology, Higher education, In-service teacher education, Pre-service teacher education, Primary education, Qualitative methods, Quasi-experimental research, Teacher professional development, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Ayelet Becher, Ben-Gurion University of the Negev, Israel

Rethinking the Continuum of Teacher Concerns

Keywords: Attitudes and beliefs, Developmental processes, Pre-service teacher education, Qualitative methods

Presenting Author:Jori Beck, Old Dominion University, United States; **Co-Author:**William Muth, Virginia Commonwealth University, United States; **Co-Author:**Kurt Stembagen, Virginia Commonwealth University, United States; **Co-Author:**Christina Santoyo, Young Harris College, United States

School-based teacher education is on the rise around the world as are debates about teacher preparation. As teacher preparation programmes are shaped by these debates, teacher education research must respond to shifting practices. The current manuscript includes data from two studies of new teacher concerns—specifically, a study of one resident (teacher candidate) enrolled in a teacher residency programme and his inservice counterparts who had graduated from the residency. Using qualitative data, the authors examined how these concerns shifted and also how the concerns of residents and residency graduates differed from those uncovered in previous research. Specifically, these concerns tended to be more advanced than previous research has indicated and, in some instances, included unique combinations of self and student concerns.

Professional development in language promotion for primary school teachers: challenges and chances

Keywords: In-service teacher education, Primary education, Quasi-experimental research, Teacher professional development

Presenting Author:Rosa Hettmannsperger, Goethe-University Frankfurt, Germany; **Presenting Author:**Christine Sontag, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Susanne Mannel, Goethe University Frankfurt am Main, Germany; **Co-Author:**Ilonca Hardy, Goethe-Universität Frankfurt, Germany

Especially in primary schools, teachers face the challenge of both developing students' subject-specific competencies and also fostering their language skills. However, well-documented, theory-based, and effective approaches guiding teachers to master this challenge are still lacking (Beese & Benholz, 2013). The current project addresses this gap by developing, evaluating, and documenting a theory-based professional development approach enabling primary school teachers to integrate language promotion into their science lessons. In a quasi-experimental field experiment, we compared the effects of two professional development approaches: Teachers in the control group ($n = 18$) participated in a series of professional development sessions, reviewing the subject matter at hand and getting acquainted with a constructivist science curriculum compiled for the study. In addition to participating in the same science instruction workshops, teachers in the experimental group ($n = 10$) participated in a series of workshops about language promotion, including a three-month phase of video-based coaching. Teachers' competencies, in particular knowledge about language promotion, pedagogical content knowledge, and constructivist beliefs, were assessed in a pre-post design. Following the professional development training, teachers in both groups taught three basic science topics in their third-grade classrooms and were filmed in selected lessons. Preliminary analyses revealed a trend for improvement in all aforementioned dependent variables, whereby these improvements were largely independent of the training condition. Facing the challenge of a small sample size and taking advantage of the availability of video-data, our strategy for data analysis is also discussed.

Pre-service teachers' perception of classroom technology integration: a longitudinal study

Keywords: Conceptual change, Educational technology, Higher education, Teaching/instruction

Presenting Author:Haoyue Zhang, University of Houston, United States; **Co-Author:**Sara McNeil, University of Houston, United States; **Co-Author:**Susie Gronseth, University of Houston, United States; **Co-Author:**Bulent Dogan, University of Houston, United States; **Co-Author:**Erwin Handoko, University of Houston, United States; **Co-Author:**George Zhao, University of Houston, United States; **Co-Author:**Lydia Ugwu, University of Houston, United States

The expectation of students' ability to use technology had changed from learning to use technology to using technology to learn. A new expectation has been proposed in 2016 saying students are supposed to learn transformatively with technology. Correspondingly, it creates a new and even higher expectation on the teachers. This study aims to investigate the perception of pre-service teachers in terms of educational technology via image and text description. A comparison of the submitted image and text from 2011 to 2018 is also made to see the trends of the perceived technology in classroom by the pre-service teachers. It suits the theme of EARLI 2019 that we learn from the past, understand the present and prepare for the future.

Session H 17

13 August 2019 15:30 - 17:00

Seminar Room - S13
Roundtable
Assessment and Evaluation, Learning and Social Interaction

Learning and Social Interaction

Keywords: Action research, Argumentation, Arts, Conversation/ Discourse analysis, Higher education, Metacognition, Peer interaction, Quantitative methods, Reasoning, Social development, Social interaction, Video analysis

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Tanya Paes, University of Cambridge, United Kingdom

Collective learning through Theater of the Oppressed in a Brazilian prison

Keywords: Action research, Conversation/ Discourse analysis, Social development, Social interaction

Presenting Author:Laure Kloetzer, Institute of Psychology & Education, Switzerland; **Co-Author:**Cristiane Leao de Castro, Institute of psychology and education, University of Neuchâtel, Switzerland

This roundtable presentation will report on an intervention conducted in a Brazilian close prison with the methodology of Augusto's Boal *Theater of the Oppressed* (Boal, 2000). Combining approaches of cultural-historical psychology (Vygotsky, 1985) and critical criminology (Baratta, 2004), the research shows how (and with which limits) arts-mediated social interactions enable individual and collective learning, through reconceptualisation in dialogue of the concept of *social reintegration of the offenders* as a social process. The presentation will focus on a specific moment of the intervention: the final presentation by the participants to an external audience and following discussions, analyzed dialogically with a method based on interlocutory analysis to track the development of new meanings in the dialogue.

What did they say to you, and how?

Keywords: Arts, Peer interaction, Quantitative methods, Video analysis

Presenting Author:Migchiel van Diggelen, Open University of the Netherlands, Netherlands; **Co-Author:**Maarten Versteeg, Eindhoven University of Technology, Netherlands; **Co-Author:**Johanna Kint, Eindhoven University of Technology, Netherlands; **Co-Author:**Sonia M. Gomez Puente, Eindhoven University of Technology, Netherlands; **Co-Author:**Daisy O'Neill, Eindhoven University of Technology, Netherlands; **Co-Author:**Bernice d'Anjou, Eindhoven University of Technology, Netherlands

Little is known about what makes peer feedback on personal and culturally dependent skills effective. This study addresses this gap and explores the content of the feedback first-year Industrial Design students provide (what) and how they provide feedback to their peers during critiquing sessions to raise their social-cultural awareness. For this purpose, fifteen videotaped critiquing sessions were transcribed and analyzed with a reliable category scheme. Data-visualization techniques were used for data-representation and analysis purposes. Findings indicate that students find it easier to address the practical nature of *cinematography* and *theory* due to its linguistic form as compared to *aesthetics* where words need to be found for sensorial experiences. Also, it was found that the first part of each critiquing session was dominated by judgments, recommendations and specifications. The critics needed approximately 5 minutes to communicate the critique they prepared upfront. Only in several cases the remainder of the session gave room to more personal and interactive dialogues and brainstorming as a constructive form of feedback. Novice design students are not familiar with critiquing as a learning-tool. Receiving feedback on such a personal skill as socio-cultural aspects of design makes students very susceptible for perceiving the exercise as a summative assessment. This study implies that, as compared to less personal and socio-cultural skills, training students for providing peer feedback on socio-cultural skills requires more attention for training students not to take the feedback personal. It seems very important and conditional for effective critiquing sessions.

High-school students and consistency: an argumentative approach.

Keywords: Argumentation, Higher education, Metacognition, Reasoning

Presenting Author:Elisabetta Montanari, Ca' Foscari University of Venice, Italy

In this contribution, I will argue in favor of a reconsideration of the role of the consistency requirement - that is, the requirement to be non-contradictory - in the argumentative practices related to educational contexts and I report the efforts to design and test a school intervention meant to promote learning consistency among high-school students via argumentation. The designed intervention, which has been already implemented into two Italian high-school and proposed to other two ones, should help to investigate and enhance the understanding of this norm among high school students, to enable them to recognize contradictions in the process of argumentation and to familiarize them with the argumentative and counter-argumentative strategies related to consistency.

Session H 18

13 August 2019 15:30 - 17:00
Seminar Room - S04
Roundtable
Assessment and Evaluation

Assessing cognitively activating interaction strategies in preschool

Keywords: Assessment methods and tools, Cognitive skills, Early childhood education, Teacher professional development

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Kit Double, University of Oxford, United Kingdom

Assessing cognitively activating interaction strategies in preschool

Keywords: Assessment methods and tools, Cognitive skills, Early childhood education, Teacher professional development

Presenting Author:Michael Lichtblau, Leibniz University Hannover, Germany; **Presenting Author:**Cathleen Bethke, Leibniz University Hannover, Germany;

Presenting Author:Stefani Linck, Leibniz Universität, Germany; **Presenting Author:**Antje Rothe, Institute for Special Needs, Germany; **Co-Author:**Heike Wadepohl, Leibniz University Hanover, Germany

The quality of teacher-child interactions in ECEC seems to be a central measurement of pedagogical quality and an important predictor for children's developmental outputs (Burger, 2010; Camilli et al., 2010; Pianta, 2015; Sylva et al., 2017). Recent (inter-)national research shows that preschool teachers perform quite well in some interaction domains (e.g. with regard to emotional support, teacher-child relationships or organizational tasks) whereas in others – above all in the area of instructional support – they are judged rather low in quality (Pianta, 2015; Wadepohl, 2016). Especially cognitively activation strategies such as sustained shared thinking (Siraj-Blatchford et al., 2004) or scaffolding (Van de Pol et al., 2010; Wood et al., 1976) seem not yet to be established during the daily routine and can only be observed infrequently or in poor quality (Kucharz et al., 2014; Wadepohl & Mackowiak, 2016). Moreover, from a methodological point of view, it is difficult to assess these strategies in preschool daily routines or at least initial approaches of them when used by the teachers. Therefore, we present different qualitative and quantitative assessments of cognitively activating interaction strategies applied in the KoAkiK research project and want to discuss pros and cons of the different approaches such as triangulation possibilities.

Session H 19

13 August 2019 15:30 - 17:00
Seminar Room - S10
Roundtable
Cognitive Science, Teaching and Teacher Education

Mixed-method Research

Keywords: Citizenship education, Competencies, Comprehension of text and graphics, Cooperative/collaborative learning, Higher education, Interdisciplinary, Literacy, Mixed-method research, Researcher education, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research

Chairperson: Margje W.J. van de Wiel, Maastricht University, Netherlands

Global education in teacher training - preservice teachers' knowledge and beliefs

Keywords: Citizenship education, Higher education, Mixed-method research, Teacher professional development

Presenting Author: Sarah Jane Brunkhorst, University of Oldenburg, Germany; **Co-Author:** Annegret Jansen, University of Oldenburg, Germany; **Co-Author:** Ulrike-Marie Krause, University of Oldenburg, Germany

This study investigates preservice teachers' knowledge, attitudes and motivation concerning global education. Global education is seen as a relevant topic in schools (KMK & BMZ, 2015). While there are several studies analysing pupils' beliefs about global education (Fischer, Fischer, Kleinschmidt, & Lange, 2016) and pupils' learning processes in this field (Wettstädt & Asbrand, 2014), equivalent studies in teacher education in Germany are still missing. The present study aims to close this gap by analysing preservice teachers' knowledge, attitudes and motivation concerning global education. For this, a questionnaire survey (with a total of about $N = 200$ students) with closed and open-ended questions and qualitative interviews ($N = 15$) are conducted.

„GeLernt“: Modelling, measuring and fostering of professional competencies of pre-service teachers

Keywords: Competencies, Cooperative/collaborative learning, Interdisciplinary, Mixed-method research

Presenting Author: Xiaokang Sun, Leibniz University Hannover, Germany; **Co-Author:** Sarah Hundertmark, Leibniz University of Hannover, Germany; **Co-Author:** Alexander Kauertz, University Koblenz-Landau, Germany; **Co-Author:** Bettina Lindmeier, Leibniz University Hannover, Germany; **Co-Author:** Christian Lindmeier, University Koblenz-Landau, Germany; **Co-Author:** Andreas Nehring, Leibniz Universität Hannover, Germany; **Co-Author:** Sandra Nitz, Universität Koblenz-Landau, Campus Landau, Germany; **Co-Author:** Vanessa Schad, University of Koblenz-Landau, Germany; **Co-Author:** Robin Schildknecht, University of Koblenz-Landau, Germany

Inclusion is a contemporary educational movement requiring specific competencies of both classroom teachers and special educators as well as cooperation between the two professions. Against this background, the BMBF-joint-project „GeLernt“ makes an attempt to incorporate inclusive teaching as part of the curriculum of Science Education (biology, chemistry and physics) and Special Needs Education of the two participating universities. Based on the P-I-D model, we have developed a competence-model for inclusive teaching as our *theoretical framework*, which includes disposition (attitude and professional knowledge) and situation-specific skills (diagnostic and didactic component). In addition to these domain-specific competencies, we are focusing on multi-professional cooperation as the essential competencies for successful inclusive teaching. To foster the competencies of students we are developing an *interdisciplinary seminar* with five modules, which will provide opportunities for multi-professional teamwork of students as well as diagnosis of the learning situations of pupils. For this, we conduct vignettes of scientific experiments of pupils from inclusive classrooms. Based on their perception and interpretation of pupils' diverse learning problems, potentials and needs, the students will learn and practice how to design teaching and learning process according to the Universal Design for Learning (UDL). In the *empirical part* we will describe the competencies-profiles of individual student according to the competence-model through quantitative questionnaires and concept maps. Through mixed-methods we want to figure out how the domain-specific competencies influence the process and the results of the co-diagnosis and the co-design of inclusive teaching-learning process.

What Little Red Riding can teach us about reading science

Keywords: Comprehension of text and graphics, Literacy, Mixed-method research, Researcher education

Presenting Author: Monica Gonzalez-Marquez, RWTH Aachen University, Germany; **Co-Author:** Andrea Philipp, RWTH Aachen University, Germany

Reading scientific articles is a foundational skill in the sciences. Although good scientific reading skills underlie many scholarly activities -- from evaluating scientific arguments to publishing papers -- universities typically focus on teaching students how to write, rather than read, scientific articles. In fact, most undergraduates never receive any explicit training in scientific reading. Understanding the main message, methodology, and limitations of an article is clearly an important skill. Ultimately, this skill leads to a better understanding of the scientific discipline and reduces the temptation to cite without reading, scan solely the abstract, or plagiarize.

The aim of this project is to develop an evidence-based method for teaching scientific reading skills. We used foundations from cognitive narratology to guide students in constructing the story told in a research article. Using a mixed method design, we conducted an experimental study with three conditions that produced open-ended qualitative data evaluated using a rubric. Students received narrative training, no explicit instruction, or the standard parts of the article method (e.g., this is the introduction, methods, etc.). After training, students were tested on their comprehension of authentic scientific articles. Pilot studies indicate that students who received the narrative method far outperformed the other groups, with the standard method resulting in the lowest comprehension. This session seeks to discuss our methods, findings and their implications in the context of the need for further research into evidence-based science reading teaching methods, and assessments of science reading competence.

Session H 20

13 August 2019 15:30 - 17:00

Seminar Room - S09

Roundtable

Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes

Experimental Studies and Comprehension of Text and Graphics

Keywords: Comprehension of text and graphics, E-learning/ Online learning, Educational Psychology, Emotion and affect, Experimental studies, Language (Foreign and second), Multimedia learning, Primary education, Science education, Second language acquisition

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 18 - Educational Effectiveness

Chairperson: Michael Goller, University of Bamberg, Germany

Oral Language Intervention in Schools Serving Language-Minority Learners: A Randomized Trial

Keywords: Experimental studies, Language (Foreign and second), Primary education, Second language acquisition

Presenting Author: Mia Cecilie Heller, University of Oslo, Norway; **Co-Author:** Arne Lervåg, Department of Education, Norway; **Co-Author:** Vibeke Grøver, University of Oslo, Norway

This randomized trial study examines the efficacy of a language intervention addressing oral language learning (expressive and receptive) in young language-minority learners from multiple-language groups in Norway. Students ($N=137$) attending first and second grade were randomly allocated to an intervention group or a waiting list control group, with the latter group receiving the intervention after posttest 1. Five assessments of oral language skills were conducted before the intervention, immediately following the intervention, and four months after the intervention. The children in the intervention group showed significant improvements in various oral language skills compared to the waiting list control group, with an overall effect size of $d=.35$. There were no significant differences between the groups at the four-month follow-up when the waiting list control group received the intervention. The program was successful in enhancing oral language skills in young language-minority learners.

How do seductive details affect mathematical modelling performance ?

Keywords: Educational Psychology, Emotion and affect, Multimedia learning, Science education

Presenting Author: Claudia Leopold, University of Fribourg, Switzerland; **Co-Author:** Anja Hugo, Center for Teacher Education, Switzerland; **Co-**

Author:Stanislaw Schukajlow, University of Münster, Germany

In two studies it was investigated how seductive details affect mathematical modelling performance. 46 (study 1) and 47 (study 2) students solved six mathematical modelling tasks on the pythagoras theorem in which the focus of seductive details was systematically varied. Seductive details were focused on relevant task information, irrelevant task information or were not included in the task. In study 1 students did not receive a drawing instruction, in study two students did receive a drawing instruction. Results replicate the seductive details effect when a drawing instruction was provided but not when drawing instruction was not provided. When seductive details were focused on relevant information students showed worse performance compared to a condition without seductive details. No differences were found when seductive details were directed on irrelevant information. These results support explanations on how seductive details do their damage that emphasize that seductive details draw the learner's attention away from relevant information.

Is Video the new Text when Searching the Web for Learning Purposes?

Keywords: Comprehension of text and graphics, E-learning/ Online learning, Experimental studies, Multimedia learning

Presenting Author:Georg Pardi, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Yvonne Kammerer, Knowledge Media Research Center, Germany;

Co-Author:Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM), Germany

The world wide web offers a huge amount of information presented in various representation formats, such as texts, pictures, and videos, made accessible via search engine result pages (SERP). One of the most popular online information sources nowadays are videos, which are easy and convenient to consume. But do learners indeed preferably select videos rather than text-based websites when searching the web for learning purposes? And is such preference affected by individuals' personal learning style such as the verbalizer-visualizer classification by Mayer and Massa (2003) or the more recent classification of object-spatial-verbal cognitive style dimensions (Blazhenkova & Kozhevnikov, 2009)? Or does the search for different knowledge types affect preference for the one or other presentation format? We aim to investigate information seekers' selection process (Brand-Gruwel, Wopereis, & Walraven, 2009) when being confronting with different information problems requiring different types of knowledge, such as factual, conceptual, or procedural knowledge (cf. Anderson & Bloom, (2014). Specifically, we seek to answer the research question whether information seekers' selection of one over another representation format is moderated by the type of knowledge that needs to be acquired in order to solve the information problem. Therefore, we plan a first online-experiment where we investigate individuals' preferred type of representation format of information resources for different information problems that need to be solved by searching the web.

Session H 21

13 August 2019 15:30 - 17:00

Seminar Room - S07

Roundtable

Assessment and Evaluation, Higher Education

Higher and Doctoral Education

Keywords: Achievement, Assessment methods and tools, Design based research, Doctoral education, Educational attainment, Higher education, Student learning, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Vanessa Russo, University Institute of Lisbon (ISCTE - IUL), Portugal

Interventions to increase completion rates in higher (online) education

Keywords: Achievement, Design based research, Higher education, Student learning

Presenting Author:Laurie Delnoij, Open University, Netherlands; **Co-Author:**Kim Dirx, Open University, Netherlands; **Co-Author:**Jose Janssen, Open University of the Netherlands, Netherlands; **Co-Author:**Rob Martens, Open University of the Netherlands, Netherlands

Non-completion in higher education is a persistent problem and a more severe problem in higher online education. To raise completion rates, the Open University of the Netherlands – which has an open access policy for enrolment - has implemented a new educational model, which shows promising results. This is, however, an initiative taken after enrolment. In a four-year research project, we aim to further reduce non-completion rates by means of an intervention prior to enrolment. To this end, a design-based research approach is adopted. This paper reports on the first step, a literature study. It was performed to create an overview of both predictors of (non-)completion, as well as interventions to raise completion rates in higher (online) education, with the aim to identify the most effective (modifiable) predictors. Results showed that modifiable consistent predictors of (non-)completion are study or learning strategies, motivation, academic self-efficacy, goals and intentions, institutional adjustment, a supportive network, and faculty-student interaction. In addition, interventions raising completion rates significantly were, for instance, a mentoring program targeted at academic and social integration, and an extracurricular course targeted at self-regulation skills. The explicit alignment between exploratory research on factors and interventions is however limited. Moreover, the interventions reported in the literature are merely post-enrolment interventions. Taking these results into account, ideas and considerations for the design of our intervention are to be discussed at the EARLI 2019.

Exploring the end stage in doctoral examination: Process, response and outcome

Keywords: Assessment methods and tools, Doctoral education, Educational attainment, Teaching/instruction

Presenting Author:Allyson Holbrook, The University of Newcastle, Australia; **Co-Author:**Kerry Dally, SORTI, The University of Newcastle, Australia; **Co-Author:**Terence Lovat, University of Newcastle, Australia; **Co-Author:**Janene Budd, University of Newcastle, Australia

This paper provides background detail on a new two-year project funded by the Australian Research Council that will investigate how examiner recommendations and feedback are filtered through institutional processes and actors to influence researcher skills development and thesis outcome. The work draws on an integrated mixed methods design to explore the roles, decisions and responses of candidates, supervisors and committees to examiner reports across Australian universities. At the time of writing institutional recruitment targets have been met and both the survey and interview phases with all groups are underway. The end stage of examination is conceptualised as a critical stage in relation to process consistency, thesis quality, candidate development, and supervision effectiveness and the study offers a unique opportunity to advance theorising in key areas such as the impact of feedback on candidate learning.

Session H 22

13 August 2019 15:30 - 17:00

Seminar Room - S11

Roundtable

Learning and Instructional Technology, Learning and Social Interaction, Learning and Special Education

Qualitative Methods and Student Learning

Keywords: Doctoral education, Educational Psychology, Philosophy, Primary education, Qualitative methods, Quantitative methods, Secondary education, Self-regulation, Social development, Special education, Student learning

Interest group: SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs, SIG 17 - Methods in Learning Research

Chairperson: Erica de Vries, Université Grenoble Alpes, France

Leadership as facilitator to implement inclusive education: Qualitative Comparative Analysis

Keywords: Primary education, Qualitative methods, Secondary education, Special education

Presenting Author:Aster Van Mieghem, University of Antwerp, Belgium; **Co-Author:**Karine Verschuere, KU Leuven, Belgium; **Co-Author:**Elke Struyf, University of Antwerp, Belgium

Inclusive Education (IE) has been subject of multiple international statements and conventions (e.g., United Nations, 1994; 2006). In 2009 politicians in Belgium ratified the UN Convention on the Rights of Persons with Disabilities, which implies that an IE system at all levels should be realized. Recent legislation in Flanders therefore aims to reduce the current segregated school system in favor of IE (M-decreet, 2014). Nevertheless, practitioners show a lot of resistance against the implementation of this new legislation. Based on previous research, we hypothesize that leadership in favor of IE can reduce this resistance and has a positive impact on the willingness of school actors to include pupils with special educational needs (SEN) in their schools (Fixsen, 2013). This study, therefore, aims to test this hypothesis with regard to the leadership dimensions of Robinson and Timperley (2007); (1) providing educational direction, (2) ensuring strategic alignment, (3) creating a community that learns how to improve student success, (4) engaging in constructive problem talk, and (5) selecting and developing smart tools in favor of IE and how they have an impact on the willingness of school actors to include pupils with SEN. In order to answer this research question a case study research was set up in 20 schools, 10 primary and 10 secondary schools. Semi-structured interviews were held with school leaders (n=26), and focus groups with teachers (n=78), counselors (n=71), and students (n=105). Furthermore, a qualitative comparative analysis will be outlined on this complex data to test the hypothesis.

What is this thing called philosophy of educational science? A qualitative content analysis.

Keywords: Doctoral education, Philosophy, Qualitative methods, Quantitative methods

Presenting Author:Leif Christian Lahn, University of Oslo, Norway

The purpose of this study is to explore how concepts and issues in philosophy of science are presented and discussed in PhD-dissertations. It is partly influenced by the philosopher of social science Lars Mjøseth (2009) and his concept of empirical researchers as methodologists that share the dilemmas of having to produce practical philosophies of science that mediate between the eternal issues of philosophy and the exigencies of justifying their research design.

The core selections of dissertations were from Scandinavian universities with supplements from US and German institutions. Secondary data information about the aim and content of doctoral courses in philosophy of science at the respective universities was collected. An explorative version of qualitative content analysis have been used in processing the data. The project is ongoing and the final analyses to be finished by June 2019. Provisional findings indicate considerable differences to what extent and how qualitative and quantitative oriented researcher address philosophy of science themes and concepts, which may raise questions about the teaching of this subject in PhD-programmes

Learning Patterns and Social-Emotional Learning of Balkan Students in Secondary Education

Keywords: Educational Psychology, Self-regulation, Social development, Student learning

Presenting Author:Shqiponjë Ahmedi, Autonomous University of Barcelona, Spain; **Co-Author:**Jose Reinaldo Martinez-Fernandez, Universitat Autònoma de Barcelona, Spain

One of the most significant challenges that educators face is to be tolerant and perceptive enough to recognize learning differences among their students. The notion that all student's cognitive skills are identical leads to an arrogant sanctioning and discrediting of the different learning styles (patterns) adopted by each student. **Therefore, a reasonable amount of cross-cultural, cross-sectional and longitudinal studies has focused on variations in students' learning patterns in different parts of the world using Vermunt's model of learning patterns. However, the question is, to what extent studies exist which are able to identify the learning patterns of other students alongside those from Europe, Asia, South America, etc. This study examines learning patterns and social and emotional learning in high school students within the cross-cultural context. The study covers three significant lines: the learning patterns that dominate the Balkan Peninsula, social and emotional learning, and lastly, the possible impact social and emotional learning may have on the patterns of learning. To sum up, this study aims to evaluate the function of learning patterns among a sample of Balkan high school students, using Vermunt's framework (Vermunt; 1996, 1998), while including data from the social-emotional learning model. Additionally, the study of emotions and socio-emotional interactions in the classroom can provide a deeper and more sophisticated understanding of the teaching and learning process, as well as the problems that arise, in order to improve the educational practice and work of teachers (Schutz et al., 2006).**

Session H 23

13 August 2019 15:30 - 17:00

Seminar Room - S15

Roundtable

Teaching and Teacher Education

Pre-Service Teacher Education

Keywords: Attitudes and beliefs, Cognitive skills, Competencies, Educational Psychology, Pre-service teacher education, Primary education, Reflection, Synergies between learning teaching and research, Teacher professional development, Video analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Detlef Urhahne, University of Passau, Germany

The ability for transfer of knowledge of content and students

Keywords: Cognitive skills, Competencies, Pre-service teacher education, Primary education

Presenting Author:Miriam Hahn, University of Education Freiburg, Germany; **Co-Author:**Katrin Lohrmann, PH Freiburg, Germany; **Co-Author:**Franziska Birke, Institute for vocational training and economic education, Germany

Research findings show a relation between the teachers' pedagogical content knowledge (PCK) and advanced learning of students. Knowledge of content and students is a part of PCK; it includes the interpretation of pre-concepts by students' statements. In primary science classes, teachers have to identify many different students' pre-concepts across a large variety of social and natural sciences topics. Clearly, it is not possible to teach every potentially occurring pre-concept. We still do not know if KCS can be transferred directly from one primary science domain theme to another. Therefore, these questions need to be answered: Firstly, whether it is possible to transfer this knowledge from one issue to another within a domain. And, assuming it is transferable, the second question is, whether it can be transferred more successfully between two more alike issues or whether a successful transfer can be achieved between issues that are thematically lying farther apart. Third question is, whether a knowledge transfer is possible even between domains. To answer these questions 180 pre-service teachers in four groups will be instructed in the following way: two groups in specialized PCK in an economic or alternatively in a physics issue, one in general knowledge about PCK and the control group will receive information about the history of primary science classes. An analysis of variance from a pre- and post-test judging pre-concepts by the pre-service teachers will show a possible transfer and whether the short intervention has been successful.

What is (needed to achieve) 'evidence-based teaching'?

Keywords: Attitudes and beliefs, Educational Psychology, Pre-service teacher education, Synergies between learning teaching and research

Presenting Author:Friederike Hendriks, University of Münster, Germany; **Presenting Author:**Jana Groß Ophoff, Tübingen School of Education, Germany;

Presenting Author:Eva Seifried, Heidelberg University, Germany; **Co-Author:**Katharina Kiemer, Universität Augsburg, Germany; **Co-Author:**Cordelia Menz, Heidelberg University, Germany

Since the early 2000s, when the idea was introduced by Davies (1999), the notion that teaching could be an evidence-based profession similarly to medicine (Rosenberg & Sackett, 1996) has gained traction (e.g., Bauer, Prenzel, & Renkl, 2015; Brown & Zhang, 2016; Nelson & Campbell, 2017; Slavin, 2002). However, as research intensified and projects sprouted, terms got blurred, definitions got more vague or partial and the question of how feasible it is to demand whatever is meant by the term 'evidence-based teaching' from teachers got out of focus. These quandaries are exemplified by the terminologies used: evidence-oriented practice (Stark, 2017), evidence-based practice (Biesta, 2007), evidence-based reasoning (Kiemer & Kollar, 2018), research-informed practice (Lindgard & Renshaw, 2010), evidence-informed practice (Nelson & Campbell, 2017), educational research literacy (Groß Ophoff, Wolf, Schladitz, & Wirtz, 2017) or data literacy (Kipper, Poortman, Schildkamp & Visscher, 2018). Furthermore, the term 'evidence' and what it entails is in itself contested (e.g., Biesta, 2007; Stark, 2017). In sum, the copiousness of research stands in stark contrast to a lack of conceptual clarity, which is precisely what we aim for with this

Round Table. The submitting authors, representing distinct research teams in the field of 'evidence-based education', aim to address these quandaries. By creating a space for discussion, we strive to reach stronger consensus on key aspects and thereby advance theory building and research in this field. We intend this Round Table to be the beginning of a joint publication in an EARLI journal.

Fostering pre-service economics teachers' reflection on their attitudes towards the discipline

Keywords: Pre-service teacher education, Reflection, Teacher professional development, Video analysis

Presenting Author: Tobias Jenert, Paderborn University, Germany; **Co-Author:** Taiga Brahm, University of Tübingen, Germany

Teacher training has always put great emphasis on reflection as a part of (future) teachers' professional development. Often, teacher educators use educational devices such as microteachings and video-recordings to guide and support pre-service teachers' reflection processes. Such guided reflection mostly focuses on the instructional aspects of teaching such as teacher-student interactions, verbal and non-verbal behavior, use of teaching and learning methods and media. In contrast, there are far less concepts on how to support students' reflection on their personal relationship to the disciplinary and content-related aspects of teaching. In the case of economic education, the question of teachers' attitudes towards economic theories and models is very current as some economic educators ask for a more critical approach to economic education. In the proposed round-table we want to discuss possibilities to foster pre-service economy teachers' reflections on their own attitudes towards the subject and potential impacts on their educational actions.

Session I 1

14 August 2019 08:30 - 10:00

Lecture Hall - H06 - Amazon Hörsaal

SIG Invited Symposium

SIG 24: Negotiating towards success: A developmental perspective on research writing 'know-how'

Keywords: Attitudes and beliefs, Case studies, Communities of practice, Developmental processes, Doctoral education, Knowledge creation, Lifelong learning, Researcher education, Science education, Workplace learning, Writing/Literacy

Interest group: SIG 24 - Researcher Education and Careers

Chairperson: Lynn McAlpine, Canada

Discussant: Montserrat Castelló, Ramon Llull University, Spain

Globally, research success is central to academic career trajectories and involves mastering a range of research genres. For instance, as a doctoral researcher, successfully defending the thesis proposal before examiners give the 'go-ahead' to PhD research. Later in the degree, peer-reviewed conference proposals, publishing and applying for scholarships may become the focus. Post-graduation within academia, research writing expands to include fellowships and early career grants. Later still, as Principal Investigators, large-scale strategic and blue skies research proposals provide new learning challenges. Finally, with increasing expectation of social engagement, researchers need to expand their research writing to incorporate public audiences. Thus, learning to successfully communicate research to different audiences challenges all researchers, regardless of experience or national funding regime. This symposium offers a rare opportunity to explore a broad, integrated perspective on the career-long journey of gaining and sustaining success in research writing – in three different research regimes: the EU, New Zealand and Canada. Inouye sheds light on how first-year doctoral students in social sciences addressed the challenges of writing and defending their research proposals. McAlpine examines how post-PhD researchers in different disciplines sought research grants using institutional and personal resources to negotiate towards success. Yousoubova investigates how three expert science PIs learned to see failure as feedback that was a significant contributor to their sustained funding success. Finally, Emerson explores the conditions required for mid-career scientists to successfully write research for both public and disciplinary audiences. In the final plenary, attendees will offer their own insights on the theme.

Managing criticism: Making the most of critical feedback

Presenting Author: Kelsey Inouye, University of Oxford, United Kingdom

The first year of doctoral study represents a challenge for many new PhD students who need to adapt to an elevated level of independence and research expectations. As part of this first transitional year, feedback, usually from supervisors, is a key pedagogical tool. Though evidence suggests that critical feedback can be particularly emotionally difficult for students, few studies have investigated how critical feedback is responded to and implemented. Drawing upon data from two studies that included a combination of semi-structured interviews, drafts of the research proposal, written supervisor comments, student notes, and a visual exercise called the journey plot, this paper sheds light on how first year doctoral students manage critical feedback in order to develop their research thinking and make progress on their research proposals. Results suggest a relationship between individual histories and goals and strategies for dealing with the negative emotions linked criticism, while emphasizing the importance of critical feedback as potential sites for learning.

Success? Getting a grant but also a tenure-track job

Presenting Author: Lynn McAlpine, University of Oxford / McGill University, Canada

Becoming a principal investigator (PI) is an aspiration for many postdocs – as is a tenure-track position. However, little is known of the actual journey from PhD graduation to being awarded the first PI grant – and hopefully an academic job. Using a narrative approach, this study explored the learning journey of eight STEM scientists in two research universities located in different EU countries, as they achieved PI-ship and a tenure-track position. The results demonstrate how postdocs make sense of and use the funding regimes on offer and characterize their increasing research success. The results contribute insight into the interaction between individual agency and the structuring elements of institutional and funding regime resources and constraints. For instance, the research regime offers funding resources but imposes constraints: designed for 'promising early career researchers' (ECR), it offers a career structure for very few. While these individuals were highly successful in this competitive environment, they did not characterize the journey as an easy one. They succeeded by sustaining a belief in themselves, viewing failure in positive ways, and negotiating the challenges by drawing on both personal and institutional resources.

Failure as feedback: building towards grant funding success

Presenting Author: Larissa Yousoubova, McGill University, Canada

Dealing with rejection in grant funding is a problem faced by all academics. Yet although rejection is a significant part of researcher navigation and negotiation of funding of academic research, little is known about how successful PIs engage with failure. Drawing on the data from an in-depth, multi-case study of research funding success in Canada, this paper explores how three experienced and successful PIs in the sciences handle failure. Data include interviews with PIs, consultations with diverse funding stakeholders, proposal drafts, reviewer comments, PI rebuttals and/or re-submissions, and agency documentation, highlighting the complexity of the PIs' purposeful interactions throughout the intellectual, interpersonal/intertextual, and institutional dimensions of research funding. Findings suggest that successful PIs learn to negotiate failure by engaging with rejection as feedback; that recovery strategies they evolve are driven by their individual research goals and are PI-specific; and that ultimately, productive engagement with failure is a significant contributor to PI's sustained long-term funding success.

The development of the adaptive STEM writer

Presenting Author: Lynn McAlpine, University of Oxford / McGill University, Canada

In the face of a series of global science-related crises (e.g. obesity, climate change, peak oil), there is a growing imperative for scientists and mathematicians to engage with public discourses of science (Olson, 2009). However, very little research has been conducted which investigates the individual and career conditions which are needed to enable a STEM researcher to make the choice to engage with public audiences. Drawing on Emerson's 2017 research, and augmenting that research with new data, this paper examines the attitudes, beliefs, processes, and career conditions and influences which contribute to writing-related choices for the mid-career STEM writer. In particular, it asks the question: what conditions are required to enable a mid-career scientist or mathematician to become an 'adaptive' STEM writer, i.e. to make the choice to write for both public and disciplinary audiences. Understanding the conditions under which

scientists and mathematicians are enabled to contribute to these discourses may provide the scientific community with an understanding of how to create an environment in which mid-career scientists can step into public engagement.

Session I 2

14 August 2019 08:30 - 10:00

Lecture Hall - H11

Invited Session

Cognitive Science, Motivational, Social and Affective Processes

EFG: Portable Brain Technologies in Research on Learning and Instruction

Keywords: Attitudes and beliefs, Cognitive development, Developmental processes, Learning Technologies, Motivation, Motivation and emotion, Neuroscience, Science education, Social interaction, Teacher Effectiveness, Technology

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Organiser: Ido Davidesco, New York University, United States

Organiser: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Discussant: Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

In the past few decades, neuroscience and cognitive psychology have produced a rich body of research on memory, learning and attention, but for the most part the translational value of this work to classroom practices has been limited. A major challenge for translation is that neuroscience research is typically conducted in artificial and highly controlled laboratory settings. Interestingly, recent developments in portable brain technology (e.g. wireless electroencephalography (EEG) and functional Near-Infrared Spectroscopy (fNIRS)) now allow taking neuroscience research out of the lab and into working classrooms and other real-life settings. In our recently founded Emerging Field Group "Portable Brain Technologies in Educational Neuroscience Research", we are exploring the use of portable brain technologies to increase the ecological validity and worldwide implementation of educational neuroscience research. In the current symposium, we focus on recent technological developments in portable EEG. The first two presentations (Davidesco and Grammer) discuss how portable EEG can be used in classrooms to measure social and attentional processes. The third presentation (Janssen) demonstrates the use of EEG-based neurofeedback tools to increase students' awareness to the malleability of, and their influence on, their own brain activity and learning processes. The final presentation (Bleichner) discusses the most recent developments in wireless EEG technology combined with smartphones and around-the-ear devices. In the general discussion, we will discuss what kind of learning processes these portable brain technologies can and can't capture, and how they might enhance the applicability of neuroscientific insights to optimize the benefits of brain research for education and child development.

Brain-to-Brain Synchrony in the Classroom

Presenting Author: Ido Davidesco, New York University, United States

The dynamic interaction between a teacher and a group of learners is fundamental to the learning process in the classroom, yet we know very little about how the brain supports these interactions. My research utilizes portable electroencephalogram (EEG) technology to measure the brain activity of groups of students during science classroom activities. Using this method, my colleagues and I have demonstrated that students' and teachers' brainwaves become synchronized (i.e. exhibit temporally coupled response patterns) when teachers and students are interacting with each other. Further, brain-to-brain synchrony was found to be predictive of students' engagement and social relationships. In my presentation, I will discuss these findings, and describe how brain technologies can be used to engage students in authentic research in their own classroom.

Measuring Attentional Brain Processes in the Classroom

Presenting Author: Jennie Grammer, UCLA, United States

Early executive function skills (EF) play a key role in children's success in early elementary school. Importantly, the transition into school also represents a new opportunity for children to develop executive function skills as a function of their experience in the classroom. In this presentation I will describe links between brain and behavioral measures of attention and children's school-related skills. Furthermore, I will present evidence for a causal link between experience in school and brain development. Finally, I will describe current efforts in my research group to track neural correlates of attention in children when they are engaged in classroom activities.

Can an experience of brain control with EEG neurofeedback help to develop growth mindsets?

Presenting Author: Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Past research shows that students vary in their ability beliefs, ranging from believing their abilities are malleable with effort (growth mindset) to believing their abilities are unalterable (fixed mindset). There is some irony in attempting to grow someone's ability beliefs from fixed to growth. However, past research corroborates this endeavor, showing benefits of psychosocial interventions in fostering growth mindset, motivation and grades in high school students. Although interesting, these benefits were relatively small and a remaining question is whether they endure. Our research group is designing a growth-mindset intervention with the aim to further increase efficacy. We expect to realize this by combining psychosocial with psychophysiological techniques. The former adheres to previous studies, including classes on the theoretical background of ability beliefs and brain plasticity, while students apply these constructs to their daily lives. The latter is the innovative part. We have developed a neurofeedback application, in which students experience actual control of their own brain. Neurofeedback is based on real-time feedback of brain activity measured with electroencephalography (EEG), for which we use portable EEG technology in 20 classrooms. We expect a synergy between psychosocial and neurofeedback classes, as both emphasize aspects of learning that one can control, while differing in how it is relayed (theoretical versus experiential). We will present results on a randomized controlled trial comprising two arms (n=400): a control condition and a growth-mindset condition. The control group will receive neuroscience classes (including an EEG demo using portable EEG), but without motivational manipulations.

Studying cognitive processes beyond the lab using wireless electroencephalography

Presenting Author: Martin Bleichner, University of Oldenburg, Germany

Electroencephalography (EEG) allows us to study the neural underpinnings of cognitive processes. Using wireless EEG we can now study these processes beyond the lab in everyday situations. We use a combination of wireless EEG hardware and smartphone-based stimulus presentation and signal acquisition. The electrodes are positioned either with a classical EEG cap, or, to allow a more flexible and less obtrusive setup, with an electrode array that is positioned around the ear (cEEGrid). We use this wireless and 'transparent' EEG setup to study cognitive processes during social interactions such as duet piano playing or engaging in verbal games taken from improvisational theatre. Furthermore, we study memory formation outdoors, as well as different aspects of auditory attention. We have shown in several studies that high-quality EEG can be recorded with this setup in the lab as well as beyond. This technology opens new research avenues to study neural processes also at the workplace or in the classroom.

Session I 3

14 August 2019 08:30 - 10:00

Lecture Hall - H07

Conceptualizing and researching time in learning and education

Keywords: Cultural psychology, Knowledge creation, Qualitative methods, Social aspects of learning and teaching, Social interaction

Interest group: SIG 25 - Educational Theory

Chairperson: Giuseppe Ritella, University of Helsinki, Finland

Organiser: Giuseppe Ritella, University of Helsinki, Finland

Organiser: Antti Rajala, University of Helsinki, Finland

Organiser: Rupert Wegerif, University of Cambridge, United Kingdom

Discussant: Peter David Renshaw, The University of Queensland, Australia

This symposium addresses the EARLI2019 theme by considering the fundamental and elusive topic of time in education. Time can be approached from a range of different perspectives: time correlates with physical and biological effects on humans; it is a socio-cultural construct that regulates social interaction; and it is a psychological category of thought through which people make sense of their lives (Perret-Clermont, 2005). The symposium brings together four contributions that discuss foundational issues and complementary perspectives on temporality in learning and education. Paper 1 provides an overarching theoretical and philosophical grounding on the topic. It reconnects the theorization of educational time with its philosophical roots, proposing a framework for reconceptualizing temporality as the weaving together of different timescales mediated by communication technology. Paper 2 presents an analysis of how time is discursively constituted in science classroom talk. Using the Bakhtinian concept of chronotope, it focuses on students' experiences of continuity and transformation across a range of timespace contexts. Paper 3 reframes chronotopic analysis to investigate how groups of students diachronically self-organize their collaboration in learning activities characterized by a limited level of structuration. Paper 4 shifts the attention to teachers struggling with the challenge of implementing a new digital learning environment. Examining their agentic orientations to educational continuity and change, it illuminates the routine, projective and judgmental dimensions of teachers' work where past, present and future interact. In sum, the four papers allow us to discuss how different notions and scales of time are intrinsically connected to and shaping education.

The role of technology in education understood as a journey into time

Presenting Author: Rupert Wegerif, University of Cambridge, United Kingdom

This paper uses critical literature review to develop a theoretical framework for understanding education as the weaving together of different timescales mediated by communications technology. Education involves bringing short-term face-to-face dialogues or personal 'inner' dialogues into a two-way relationship with long-term dialogues of culture such as science, maths or art. An initial critical review of social anthropological and historical literature on the role of communications technology in education is used to argue that the nature of the communications technology used to weave together timescales impacts upon how we understand education and how we practice education. It is then argued that much of the theory and practice of education today is based upon the apparently time-transcending affordances of print technology. This account is augmented by illustrations of the affordances of specific new communications technology in relation to the weaving together of different timescales a) connecting learning experiences together in a longer scheme of work b) connecting local time to the long-term dialogues of culture such as science, maths and art. In each case it is shown how the technology takes the form of a voice in a dialogue giving the student access to new outside perspectives from which to look back and to see themselves and their learning journey. The theoretical framework developed has implications for policy and practice because it suggests the most effective ways to use different kinds of communications technology as a kind of ski-lift bringing together different levels or scales of time.

Creating learning opportunities and identities through multiple time-spaces in class conversations

Presenting Author: Kenneth Silseth, University of Oslo, Norway; **Co-Author:** Hans Christian Arnseth, University of Oslo, Norway

In this paper we analyze how multiple time-space configurations mobilized and invoked in whole class talk creates new learning opportunities and identities for students. In and through the teacher's work of connecting experiences across time and space, students meaning making of complex concepts in science education is supported. Theoretically and analytically we are interested in how time is constituted in classroom talk and how coordinating multiple time-spaces create new opportunities for meaning making. More generally this concerns how participants in classroom talk experience a sense of continuity and transformation across sites. Our analytic starting point is that meaning, transition and social order is a property of interacting systems that operate on interconnected timescales. Our primary unit of analysis is social interaction through which the dynamic relationships between persons and situations become visible.

Teachers' agentic orientations to educational continuity and change: A temporal framework

Presenting Author: Antti Rajala, University of Helsinki, Finland; **Co-Author:** Kristiina Kumpulainen, University of Helsinki, Finland; **Co-Author:** Anu Kajamaa, University of Helsinki, Finland

This paper examines teacher agency in making sense of an educational change effort in two Finnish schools. We examine temporal agentic orientations in the teachers' accounts while they reflect on the uptake of a new digital learning environment at their schools as part of the adaptation to the new Finnish core curriculum. Agency is viewed in a temporal framework and as an interactional process. We focus on how agentic orientations are composed of iterative, projective and practical-evaluative dimensions where past, present and future interact. The empirical data derive from two public schools in Helsinki. The data comprise thirteen teachers' interviews (43h), which were analysed using qualitative content analysis and thematic analysis. Our analysis revealed four agentic orientations with distinct temporal dimensions of agency. Firstly, the practical-evaluative orientation emphasized the contextualization of the educational change in the practical realities and actual details of the teachers' work. Secondly, through the reproductive orientation the change effort was appropriated within a habitual pedagogical framework that placed value on existing practices. Thirdly, the critical-projective orientation helped the teachers to articulate their criticism of the current pedagogical practices in the school. Fourthly, through the creative-projective orientation, the teachers used the FUSE Studio as a springboard to realize their long-term pedagogical visions and goals. Overall, our findings suggest that a temporal approach is vital for developing a more nuanced understanding of the meaning-making processes teachers go through during their possibly agentic adaptation to education reforms.

Examining the sequential organization of knowledge creation: a diachronic analysis

Presenting Author: Giuseppe Ritella, University of Helsinki, Finland

Pedagogical approaches such as knowledge creation (Paavola & Hakkarainen, 2005) consider learning as a creative, self-organizing process. Thus, these approaches are characterized by a limited level of structuration that is imposed by the teacher and the learning environment. If a substantial part of organizing learning practices is carried out by groups of learners, to fully grasp the process of knowledge creation, we need to examine how students come to fruitfully self-organize their own practices. Although there are some attempts to deal with this issue in the literature, the processes through which the students interactively organize their activities in time are not yet fully disclosed. The present investigation aims at addressing this research gap by examining how groups of students diachronically organize their collaboration when they participate to learning activities designed according to the knowledge creation approach. A specific focus of the analysis is on the micro-level dialogical processes through which the students negotiate the organization of the activity and deal with the constraints and challenges related to coordination. 12 sessions of a media design course were filmed and qualitatively analyzed. Through the analysis, it was possible to identify different phases of the collaboration characterized by recognizable, different patterns of organization of the activity. Moreover, the organization of space-time was characterized by constraints and challenges that the students had to address to successfully coordinate their efforts and complete the collaborative task.

Session I 4

Understanding the Complexities of Self-Regulated Learning using Multimodal Data Streams

Keywords: Collaborative Learning, Educational Psychology, Educational technology, Interdisciplinary, Learning approaches, Learning Technologies, Metacognition, Self-regulation, Social interaction

Interest group: SIG 16 - Metacognition

Chairperson: Roger Azevedo, University of Central Florida, United States

Chairperson: Maria Bannert, Germany

Discussant: Dragan Gasevic, Monash University, Australia

Multimodal trace data collected *during* students' real-time interactions with advanced learning technologies (ALTs) such as intelligent tutoring systems, hypermedia, multimedia, serious games, collaborative systems, and immersive virtual learning environments is transforming our understanding of self-regulated learning (SRL). This symposium includes a group of leading international researchers who will present and discuss different multimodal trace data of SRL during learning, reasoning, and problem solving across different tasks and answers the following questions: (1) *what are* and *how do* multimodal trace data (from log files, eye tracking, human-machine interactions, facial expressions of emotions, physiological sensors, discourse between multiple human and artificial agents, verbal protocols) reveal about the nature of the underlying cognitive, affective, metacognitive, motivational, and social regulatory processes across tasks, domains, contexts, and ALTs?; (2) what are the challenges posed by (1) for current conceptual, theoretical, methodological, and analytical SRL issues; and (3) how can we use (1) and (2) to design ALTs capable of supporting and fostering students' SRL across contexts and ALTs? The contributors of this symposium are members of a Center of Innovative Research (E-CIR) of the European Association of Research for Learning and Instruction (EARLI) whose main goal is to address these questions from a multidisciplinary perspective.

Studying Self-Regulatory Processes using Multimodal Trace Data during Human-Machine Interactions

Presenting Author:Roger Azevedo, University of Central Florida, United States; **Co-Author:**Michelle Taub, University of Central Florida, United States; **Co-Author:**Elizabeth Cloude, University of Central Florida, United States; **Co-Author:**Megan Price, University of Central Florida, United States

Understanding the complex nature of cognitive, affective, metacognitive, and motivational (CAMP) processes during learning with advanced learning technologies (ALTs) is key to understanding how these processes impact learning about conceptually challenging topics. Current methodological and analytical approaches to studying SRL processes (e.g., self reports) have several weaknesses compared to capturing real-time deployment of SRL processes. Our approach has been to use MetaTutor (an intelligent, hypermedia multi-agent ALT) to collect rich multimodal multichannel trace data of CAMP processes during learning (e.g., eye tracking, facial expressions of emotion). In this presentation, we focus on the challenges in measuring, analyzing, and inferring temporally unfolding CAMP self-regulatory processes during human-machine interactions with MetaTutor. We will focus on presenting and discussing the methodological and analytical challenges associated with understanding and inferring CAMP processes by using examples from multichannel, multimodal data (e.g., log files, eye tracking, facial expressions of emotion, physiological data, and screen capture of learner-system interactions) collected from several studies with undergraduates as they learned with MetaTutor.

Temporal process analysis to better understand different prompt utilization

Presenting Author:Katharina Engelmann, Technical University of Munich (TUM), Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany

Metacognitive Prompts often help learners to improve their self-regulated learning process and performance. However, in some settings, prompts fail to live up to this promise. A deeper analysis using educational process mining techniques help to improve our understanding of the SRL process and thus might explain how prompts support or fail to support learners. This experimental study investigated the effect of metacognitive prompts on learning processes, measured by think aloud protocols, and performance measures. Students in the experimental condition learned with metacognitive prompts and were grouped regarding their coded interpretation of the prompts presented to them during learning. A post-hoc analysis of this data shows two groups of learners, learners who utilized the prompts mainly as a call to action (n=12) and learners who utilized the prompts mainly as a reflection request (n=11). The learners who utilized the prompts mainly as a reflection request showed a descriptively higher performance in transfer knowledge. The process models for both subgroups differ with regards to student's monitoring. While the interpretation of this results must be made cautiously due to the small number of participants in each subgroup, the results suggest a reflective component in metacognitive prompts to be beneficial for a self-regulated learning process and perhaps even learning outcomes.

What can Multimodal Data tell about Monitoring and Task Difficulty during a Collaborative Exam?

Presenting Author:Jonna Malmberg, University of Oulu, Finland; **Co-Author:**Eetu Haataja, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Tapio Seppänen, University of Oulu, Finland

In this study the authors use multimodal data, such as video and psychophysiological data to examine how student contributions to monitoring processes are related on physiological synchrony and physiological arousal during collaborative exam. Participants were four groups of three members each, selected for further study from an initial set of 31 students. The individual and group level analysis investigated arousal and physiological synchrony in concordance with monitoring analysed from the video data. The results showed that monitoring activities exhibited a significant correlation with the arousal, indicating that monitoring events are reflected in physiological arousal. Physiological synchrony occurred when task difficulties were monitored.

How social challenges influence dyads' socially-shared regulation of learning in hypermedia

Presenting Author:Erdem Onan, University of Oulu, Finland; **Co-Author:**Cindy Paans, Radboud University Nijmegen, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Eliane Segers, Radboud University Nijmegen / University of Twente, Netherlands; **Co-Author:**Ludo Verhoeven, Radboud University Nijmegen, Netherlands

Social challenges during collaborative learning are known to affect learning outcomes, but how this affects socially shared regulated learning (SSRL) is less understood. Therefore, this study investigated how social challenges influence children's learning outcomes (assignment quality) and their SSRL (frequency and sequential patterns of learning activities). We analyzed the data of 5th grade students (N= 60) who learned in dyads about the heart in a hypermedia environment. Dyads were divided on in low and high social challenges dyads based the relative frequencies of the rejection and engagement activities. The results indicated that low challenge dyads outperformed high challenge dyads on assignment quality. Moreover, low challenge dyads performed more cognitive processing and high cognition, whereas off-task activities occurred more frequently in high challenge dyads. Accordingly, low and high challenge dyads showed different sequential patterns among learning activities. While for low challenge dyads off-task activities did not appear in the process model, for high challenge dyads off-task activities and a cluster of rejection and engagement activities formed an isolated process separated from the other learning activities. Also for high challenge dyads high cognition did not appear in the process model, whereas for low challenge dyads high cognition was centrally connected in the process to reading, processing and relational support. These results indicated that social challenges not merely affect learning outcomes, but also influence SSRL both with regard to the frequency, as well as the sequential patterns among learning activities.

Session I 5

14 August 2019 08:30 - 10:00

Lecture Hall - H09

Symposium

Cognitive Science, Learning and Special Education

The importance of linguistic and cognitive information-processing skills for mathematical learning

Keywords: Cognitive skills, Competencies, Language (L1/Standard Language), Mathematics

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany

Organiser: Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany

Discussant: Evelyn Kroesbergen, Radboud University, Netherlands

Research of mathematical learning shows a prominent role of linguistic skills and cognitive information processing skills (e. g. working memory, attention) within mathematical knowledge acquisition and application. Both, linguistic as well as cognitive skills are also closely related, which points to complex relationships within all three domains. Therefore, the aim of this symposium is to shed light on the described interdependencies within mathematical learning processes in more detail.

Spanning the critical age of mathematical basic skills (11-66 month), we want to identify how far early linguistic skills as well as early cognitive processing skills are predicting pure and applied mathematics (study 1). Beyond the critical age of preschool skills, we look into the effective direction within the developmental interdependencies of all three domains (4-8 years). Particularly, we are interested whether already existing knowledge, thus reduced working memory capacity use, can release new resources for knowledge acquisition (study 2). Based on this assumption implying that working memory performance can be influenced, we will explore the extent to which this cognitive system, including its ability to focus attention, is trainable to support academic achievement especially in mathematics and reading in school (7-12 years; study 3). Moreover, we assume that the way language is used to name mathematical expressions can have a significant impact on the required working memory capacity in terms of rational numerical processing after school age (study 4). The symposium may contribute to a better comprehension of domain-specific and domain-overarching relationships within mathematical learning in a wide age range.

The role of language and working memory in children's mathematics skills

Presenting Author: Andrea Diaz Barriga Yanez, The University of Sheffield, Mexico; **Co-Author:** Daniel J Carroll, University of Sheffield, United Kingdom; **Co-Author:** Danielle Matthews, University of Sheffield, United Kingdom

Mathematics skills provide us with the means and tools to understand and improve our world. Moreover, a good level of mathematics skills serves as a solid foundation for future learning, and for academic and career outcomes. Thus, understanding the building-blocks of children's mathematics skills will allow us to design targeted intervention programs aiming to enhance children's mathematics proficiency. Two cognitive abilities have been found to be important for children's mathematics skills: working memory-which refers to the system that allows the child to hold and manipulate information in mind during the performance of complex tasks such as learning, reasoning, and comprehension - and language skills. Three experiments were conducted in order to investigate the role of working memory and language skills in children's mathematics skills. Specifically, these experiments focused on (i) the contributions of working memory components (Study 1 and 2), (ii) the contributions of concurrent language skills (Study 2 and 3), and (iii) the longitudinal linguistic precursors (Study 3) of mathematics skills presented in two different contexts: a relatively pure context and an applied context. Overall findings from these studies suggested that for 4-year-olds and 5-and-6-year-olds, pure and applied mathematics are not performed in the same way. That is, different working memory components related differently depending on the mathematics skills; however, they were sub-served by language skills equally. Theoretical and educational implications of these studies will be discussed.

The role of language and working memory for mathematical development in children between age 4 to 10

Presenting Author: Nurit Viesel-Nordmeyer, Technische Universität Dortmund, Germany; **Co-Author:** Ute Ritterfeld, Technische Universität Dortmund (TU), Germany; **Co-Author:** Carina Lüke, Pädagogische Hochschule Heidelberg, Germany; **Co-Author:** Wilfried Bos, Technische Universität Dortmund, Germany

Language skills play an important role in early mathematical learning and during primary school. Both academic skills – language and mathematics – are also highly related with working memory capacities. Previous knowledge, which is also a strong predictor for academic learning, can free some of the limited capacity in working memory and hereby facilitate further knowledge building in language as well as mathematics. The present study aims to examine existing developmental interdependencies between language, mathematics and working memory in more detail. Specifically, we intend to look whether there are mutual influences within the procedure of mathematical and linguistic competence development with processing by working memory. Moreover, it will be examined which role the analyzed development plays for the relationship between language and mathematic skills. Using data of starting cohort 2 from German National Educational Panel Study (NEPS) ($n = 354$), longitudinal path analyses have been performed. Mediation analyses with additive data from a smaller but elaborate set ($n = 43$) have been computed due to more mathematical measurements in preschool age. Both data sets deliver comparable results: Besides a fundamental influence of language on the mathematical development (4-8 years), mutual influences were shown between working memory and mathematics (4-8 years) as well as between grammar and mathematics (4-7 years). Working memory acted as mediator for language effects on mathematics while language mediated effects of working memory on mathematics. The relevance of these results for a better comprehension of language and working memory within the mathematical learning processes will be discussed.

The effect of language on rational number comparison

Presenting Author: Iro Xenidou-Dervou, Loughborough University, United Kingdom; **Co-Author:** Camilla Gilmore, Loughborough University, United Kingdom; **Co-Author:** Elizabeth May Jones, Loughborough University, United Kingdom

Research has indicated that the way numbers are named affects adults' whole number processing. However, little is known about the effect of language on rational number naming. Anecdotal there appear to be differences between languages in the way rational numbers are named. For example, in English 3.45 is typically named "three point four five", compared with "three point forty-five" in Greek. The Greek allows "chunking", which could relieve working memory resources. However, the English way does not attribute false magnitude to the decimals, which could help with understanding. The present study sought systematic evidence for this difference with English- and Greek-speaking adults, and explored whether this was associated with differences in rational number comparison skills. We expected an advantage for Greek-speakers in two-decimal number comparison due to use of the chunking strategy, but an advantage for English-speakers in the comparison of two vs. three digit decimals. Forty-one English and thirty Greek adults took part in the study. They completed two tasks: a number naming questionnaire, to acquire empirical data on how adults actually name rational numbers, and a symbolic comparison task. Our results showed that there are indeed systematic differences in how English and Greek-speaking adults name rational numbers. Interestingly, there were no group differences in speed or accuracy of comparing rational numbers. In other words, these differences do not appear to have an impact on processing rational numbers, one way of naming a rational number is not better than another.

Academic and Brain Functional Connectivity Effects After Training Schoolchildren in Working Memory

Presenting Author: Noelia Sánchez-Pérez, University of Zaragoza, Spain; **Co-Author:** Alberto Inuggi, Istituto Italiano di Tecnologia, Robotics Brain and Cognitive Sciences Unit, Center for Human Technologies, Italy; **Co-Author:** Alejandro Castillo, Department of Basic Psychology and Methodology, Faculty of Psychology, University of Murcia, Spain; **Co-Author:** Guillermo Campoy, Department of Basic Psychology and Methodology, Faculty of Psychology, University of Murcia, Spain; **Co-Author:** Carmen González-Salinas, Department of Developmental Psychology and Education, Faculty of Psychology, University of Murcia, Spain; **Co-Author:** Luis J. Fuentes, Department of Basic Psychology and Methodology, Faculty of Psychology, University of Murcia, Spain

The present study examined the effects of a computer-based training program on children's academic achievement and functional brain connectivity. Training included both working memory (WM) and mathematics tasks. The results revealed a significant improvement in math and reading abilities among the children who received the training compared to those children who did not. Moreover, most of the improvements were related to training with WM tasks rather than math tasks. Concerning functional brain connectivity, the differences between the two groups of children were observed in areas of the attentional networks when tested 6 months after the training was terminated. Findings showed also stronger relationships between reading improvements and functional connectivity in a right inferior frontal gyrus (IFG) cluster. The r-IFG and mesial and left inferior occipito-temporal areas were more strongly related to reading improvements in training children compared to the control group. These findings highlight the relevance of WM trainings integrated in real-life school environments in boosting academic performance and functional brain connectivity.

Session I 6

14 August 2019 08:30 - 10:00

Lecture Hall - H08

Symposium

Developmental Aspects of Instruction, Learning and Social Interaction, Teaching and Teacher Education

Teachers' attempts to instruct metacognition and self-regulated learning

Keywords: Cognitive development, Developmental processes, Experimental studies, Instructional design, Learning approaches, Metacognition, Self-regulation, Social interaction, Student learning, Teaching approaches, Teaching/instruction

Interest group: SIG 16 - Metacognition

Chairperson: Mariette van Loon, University of Bern, Switzerland

Discussant: Nancy Perry, University of British Columbia, Canada

Teachers can support their students' self-regulation via explicit instruction of metacognitive strategies, and indirectly via student-centered teaching that requires students to self-regulate (Paris & Paris, 2001). While research on explicit self-regulation training has shown that metacognitive strategies can be conveyed effectively by researchers, implementation by teachers yielded lower effects (Dignath & Büttner, 2008). Although training studies conducted without the involvement of teachers have delivered insights into how self-regulation can be supported, more research focusing on the teachers is needed to provide more externally valid evidence of effective support.

This symposium aims to compile research on teachers' explicit as well as indirect attempts at fostering metacognition using innovative methods that go beyond self-report, such as classroom observations, discourse analysis, and vignette test. The studies are unified by their focus on the effectiveness of teachers' promotion of metacognition, but apply a broad range of designs:

While the first study investigates the integration of explicit metacognition, compared to an alternative intervention, the second study focuses on the added value of teachers' indirect promotion of metacognition compared to explicit strategy training outside the classroom. The third study examines how teachers' explicit instruction of metacognition as well as their child-vs.-teacher-centered instruction is related to children's learning. The fourth study reverses this research question by investigating with a vignette test whether teachers adapt their explicit and indirect promotion of self-regulation to their students' prerequisites.

The symposium delivers new insights into the effectiveness of teachers' attempts to support metacognition from different angles.

Teacher-student metacognitive discourse and outcomes: Evidence from a video-based training study

Presenting Author: Bracha Kramarski, Bar-Ilan University, Israel; **Co-Author:** Anat Shilo, Bar-Ilan University, Israel

This study examines the relative effectiveness of *teacher-student metacognitive discourse scaffolds* by comparing two groups. The metacognitive group was exposed to generic metacognitive IMPROVE self-question prompts for *Comprehension, Connection, Strategy, and Reflection*, to stimulate their discourse with metacognitive skills (planning, monitoring, reflection). The control group was exposed to discourse questions oriented to domain-specific knowledge (declarative, procedural, explanatory) for facilitating mutual teacher and student *metacognition, self-efficacy, class discourse* and *sense making* in problem solving as a transfer performance in a mathematics context.

The study involved 32 math teachers and their 824 fifth grade students from one district in Israel, assigned to a quasi-experimental trial and randomly assigned to each group. A multilevel regression analysis indicated a significant change on the self-report measures, and a transfer test favoring the metacognitive group. These findings were supported by in-depth analysis of a videotaped discourse used in each class ($n = 32$), and with two teachers' case studies (one from each group) favoring the metacognitive group in the use of explanatory and reflective discourse and talk moves, particularly in giving students time to think. The current study contributes an effective, practical, detailed program with a high effect level, to enhance teachers and students gains. Intervention programs rarely attempt to foster metacognition and self-efficacy in one study with mixed methods in both areas of teachers' and students' learning. The detailed teacher-student metacognitive discourse analysis is important, in accordance with researchers who have suggested suitable assessment methods for metacognition within an authentic setting.

Fostering transfer of metacognitive learning strategies by direct and indirect training

Presenting Author: Corinna Schuster, Ruhr University Bochum, Germany; **Co-Author:** Ferdinand Stebner, Ruhr-University Bochum, Germany; **Co-Author:** Malte Jansen, Humboldt University Berlin, Germany; **Co-Author:** Joachim Wirth, Ruhr-University Bochum, Germany; **Co-Author:** Detlev Leutner, University of Duisburg-Essen, Germany

Numerous studies demonstrate positive effects of direct training on metacognitive learning strategies (MLS). In direct training, MLS are explicitly taught. Research shows that students are able to use MLS after direct training to deal with learning tasks that are structurally similar to training tasks (near transfer). However, they fail in using MLS for dealing with structurally dissimilar learning tasks (far transfer). Therefore, indirect training additional to direct training could be an option to foster transfer of MLS. In indirect training, the learning environment is designed to help learners transferring learning strategies, wherefore combining direct and indirect training is promising: students get the support to learn and transfer MLS at the same time. To test this assumption, in a cluster randomized controlled study two interventions ($N=866$) – direct and indirect training combined (EG1) and direct training only (EG2) – were compared with a non-treated control group (CG). Multilevel regression analyses show that EG1 outperforms CG significantly in terms of metacognitive strategy use in near and far transfer tasks, whereas there were no significant differences between EG2 and CG. This result is considered as an argument for the positive effect of combining direct and indirect training to foster transfer of MLS in self-regulated learning.

Relations between teachers' instructions and children's monitoring and regulation of learning

Presenting Author: Mariette van Loon, University of Bern, Switzerland; **Co-Author:** Natalie Bayard-Guggisberg, University of Bern, Switzerland; **Co-Author:** Martina Steiner, University of Bern, Switzerland; **Co-Author:** Claudia Roebbers, University of Bern, Switzerland

Many children have difficulties discriminating between well-learned and not-yet-mastered tasks. Particularly when they make errors, they do not recognize these, and they often do not select these for further study. This may cause them to miss learning opportunities. Teachers play a key role in supporting children with metacognition. Particularly, teaching about monitoring and regulation, and child-centered (rather than teacher-directed) teaching may be beneficial. In the present study, we investigated how teachers' instructions for monitoring learning and strategy, and the extent to which teaching was child-centered, affected children's performance, their monitoring, and their restudy selections. Twenty-one teachers and 287 children (2nd and 4th grade elementary school) participated. Teachers instructed a cryptography task, children had to learn the match between letters of the alphabet and corresponding symbols (teachers were observed and audio-recordings were made). Then, children were asked to (a) make restudy selections, (b) complete a test, and (c) self-monitor test performance. Fourth graders were more likely to select incorrect responses for further study than 2nd-graders. Teachers often taught about making associations, planning, and testing, evaluating learning strategies, self-monitoring progress, and item difficulty. Further, teaching was more often teacher-directed than child-centered. Most importantly, child-centered instructions (i.e., giving children autonomy to explore and experience the task themselves) were more beneficial than teacher-directed instructions. This seems to imply that not only the content of the instructions itself, but specifically the way these were given, affects children's learning, monitoring, and regulation.

Do teachers adapt their promotion of SRL to their class? Development of a vignette test

Presenting Author: Charlotte Dignath, Goethe-University Frankfurt, Germany; **Co-Author:** Zemira Mevarech, Bar-Ilan University, Israel

Research has shown that there are different approaches to supporting self-regulation: Teachers can directly teach regulation strategies to their students, or they can create an open learning environment that requires students to self-regulate rather indirectly. However, it remains unclear whether teachers follow the

consensus in the literature that fostering self-regulation succeeds best when teachers gradually fade their support from explicit strategy instruction to students inexperienced with self-regulation, down to indirect promotion of self-regulation to experienced students. In order to close the gap in research on whether teachers adapt their support of self-regulation to their students' needs, we developed a vignette test to investigate differences in teachers' suggestions as a function of the described class.

The results showed that the vignettes were discriminative, and in line with our assumptions participants suggested more explicit strategy instruction to the class with little experience in self-regulation. However, results were inconsistent regarding teachers' suggestions to foster self-regulation indirectly. The study provides first results of the vignette test when used to assess the adaptiveness of teachers' suggestions to foster self-regulation in different classes.

Session I 7

14 August 2019 08:30 - 10:00

Lecture Hall - H10

Symposium

Cognitive Science

Strategy flexibility and adaptivity in primary school arithmetic: student and instructional factors

Keywords: Cognitive development, Mathematics, Numeracy, Primary education, Quantitative methods, Teaching/instruction

Interest group:

Chairperson: Joke Torbeyns, KU LEUVEN, Belgium

Discussant: Marian Hickendorff, Leiden University, Netherlands

Children and adults know and use a variety of strategies to solve arithmetic problems. Throughout the world, mathematics educators stress the importance of children's ability to solve mathematics problems flexibly and adaptively: with a variety of meaningful strategies, that are selected in an optimal way. The current symposium consists of four empirical contributions investigating students' flexible and adaptive strategy use and the impact of several student and instructional factors. Together, the studies include students from third to ninth grade from three different countries (US, Belgium, and Germany). The two first contributions focus on the domain of multidigit addition and subtraction, addressing the question how learning opportunities (mathematics textbook, study 1) and student characteristics (experience with solving subtraction problems, study 2) affect students' flexible and adaptive strategy use. The third and fourth contribution focus on arithmetical domains that receive less research attention: multidigit multiplication and division (study 3) and rational numbers (study 4). These studies aim to identify the relations between flexibility and adaptivity on the one hand and student characteristics (conceptual and procedural knowledge in the arithmetical domain at stake) on the other. All four studies employ advanced methodological/statistical approaches to address the research questions, such as multilevel analyses (study 1), the choice/no-choice design (study 2), and latent class and latent profile analyses (studies 3 and 4). The theoretical and educational significance of the contributions is discussed by dr. Hickendorff, an expert in the field of flexibility and adaptivity in primary school arithmetic.

10-12-year-olds' flexible use of subtraction by addition in the number domain up to 1000

Presenting Author: Joke Torbeyns, KU Leuven, Belgium; **Co-Author:** Gwen Verguts, KU Leuven, Belgium; **Co-Author:** Lieven Verschaffel, KU Leuven, Belgium

We investigated 4th- to 6th-graders' flexible use of direct subtraction (DS) versus subtraction by addition (SBA) when mentally solving subtractions up to 1000. Children's strategy flexibility was analysed on the basis of both item (i.e., numerical difference) and individual (i.e., strategy efficiency; experience with multi-digit subtraction) characteristics. We offered 153 4th- to 6th-graders (about 50 children per grade) multi-digit subtractions up to 1000 in one choice condition (choice between DS or SBA on each item) and two no-choice conditions (mandatory use of either DS or SBA on all items). We distinguished between two types of subtractions, i.e., subtractions with a very small (e.g., 504-476=___) versus very large difference (e.g., 616-28=___) between the minuend and the subtrahend.

Although mathematics instruction focused on the mastery of only DS, most 4th-, 5th- and 6th-graders reported SBA to solve the items in the choice condition. In all grades, SBA use was more accurate and faster in the no-choice conditions than DS, particularly on small-difference problems. Importantly, not only 6th- but also 4th- and 5th-graders flexibly fitted their strategy choices to both numerical item characteristics and individual strategy efficiency. Although older children and children of higher mathematical achievement levels tended to make more flexible strategy choices, our findings indicate that also children with less experience in multi-digit subtraction and of weaker achievement levels are able to flexibly apply an untaught mental computation strategy, i.e., SBA. As such, they challenge mathematics instruction practices that focus heavily on DS.

Effects of Textbooks on Primary School Children's Adaptive Use of Strategies in Arithmetic

Presenting Author: Aiso Heinze, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Henning Sievert, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Ann-Katrin van den Ham, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Inga Niedermeyer, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Over the past two decades educational research has become increasingly interested in the development of children's adaptive use of strategies in arithmetic. Even though there are several studies investigating the impact of different teaching approaches, knowledge concerning effects of learning resources is relatively low. Using data of a three-year longitudinal study from Grade 1 to 3 with 1404 students from 93 classes, we examined learning opportunities presented by textbooks regarding adaptive use of strategies in multi-digit addition and subtraction, and in a subsequent multilevel analysis, the effect of the resulting textbook quality on third-graders' adaptive use of strategies. The results show discrepancies in the textbooks' quality concerning learning opportunities for adaptive use of strategies and a substantial effect of textbook quality on students' adaptive use of strategies after three years of schooling. An additional cross-level interaction suggests that the effect of textbook quality increases with children's prior arithmetic knowledge.

Distinguishing adaptivity in rational number knowledge

Presenting Author: Jake McMullen, University of Turku, Finland; **Co-Author:** Erno Lehtinen, University of Turku, Finland; **Co-Author:** Minna M Hannula-Sormunen, University of Turku, Finland; **Co-Author:** Robert Siegler, Carnegie Mellon University, United States

Given the important of flexible problem solving in the domain of mathematics, and the relative wealth of research on students' rational number understanding, it is surprising that fairly little research exists on students' adaptivity with rational number knowledge. The present study aimed to outline, for the first time, how 394 seventh and eighth grade students' knowledge of rational number characteristics and arithmetic relations are expressed in a novel task, the arithmetic sentence production task. We found a distinction within students with well-developed rational number knowledge and skills in adaptive rational number knowledge. We found that adaptive rational number knowledge is partially distinct from other aspects of rational number conceptual knowledge and procedural skills. Adaptive rational number knowledge may be indicative of the integration of knowledge of the magnitudes, operations, and representations of rational numbers. Well-developed conceptual knowledge of these features of rational numbers appear to be necessary, but not sufficient for adaptivity with rational numbers.

Profiles of fourth and fifth graders' understanding and making use of multiplicative relations

Presenting Author: Andreas Schulz, Zurich University of Teacher Education, Switzerland

Learners within the conceptual field of multiplication show a richness of co-existing understandings and misunderstandings. The interactions between these distinguishable understandings contribute to variable learning paths. Hence, flexibility in this field does not only refer to the correct use of a variety of strategies. Rather, the successful adaptation of multiplicative thinking in a variety of different situations is pivotal. The present study assessed 472 fourth and fifth graders' abilities in multiplicative thinking (MT) and reasoning about number relations (RNR) and coded their correct and erroneous uses of whole number-based solution strategies and digit-based algorithms in six multi-digit division problems. The Rasch-based measurement of MT and RNR supported the identification of competency levels within each of these two scales. In the further analysis, five well-interpretable multi-dimensional profiles (latent classes) of children's understanding and use of multiplicative relations were identified and characterized. These profiles provide the basis for a discussion of the interaction between the separately assessed partial abilities regarding students' understanding and making use of multiplicative relations. Furthermore, the profiles suggest different

kinds of tailored instruction for students' further learning.

Session I 8

14 August 2019 08:30 - 10:00
Seminar Room - S11
ICT Demonstration
Teaching and Teacher Education

ToolboxTeacherEducation - Teaching and Learning in the Digital Age

Keywords: Computer-assisted learning, E-learning/ Online learning, Multimedia learning, Teaching approaches

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Jaakko Hilppö, University of Helsinki, Finland

The main goal of the *ToolboxTeacherEducation* is to develop an online-based, publicly accessible platform that focuses on connecting teaching and learning of the three, in teacher education involved disciplines: subject, subject didactics and educational science. The central elements of the *ToolboxTeacherEducation* are learning modules, which are based on the use of multimedia in order to establish links between the disciplines mentioned above and school practice. Thus, the *ToolboxTeacherEducation* supports profession-oriented, interdisciplinary and individualized teaching and learning. In order to connect the disciplines, we embedded scripted instructional videos. Every learning module contains various material like theoretical basics, scripted instructional videos, video tutorials, dynamic mathematical visualizations and didactic accompanying material that offers support for teachers using the platform in their courses. The material of the learning modules is combinable or it is possible just to use some parts. The material can be used as part of a classic classroom course, as part of a flipped classroom or blended learning approach or as part of self-study for students, teachers and anyone who wants to expand their knowledge in the field of teacher education. During the ICT-Demonstration we will give a tour through the learning platform and show the individual features.

ToolboxTeacherEducation - Teaching and Learning in the Digital Age

Presenting Author:Dagmar Frick, Technical University of Munich, Germany; **Co-Author:**Jana-Kristin von Wachter, Technische Universität München (TUM), Germany; **Co-Author:**Doris Lewalter, Technical University of Munich (TUM), Germany; **Co-Author:**Julia Bernhard, Technische Universität München (TUM), Germany; **Co-Author:**Bernhard Werner, Technische Universität München (TUM), Germany; **Co-Author:**Kerstin Huber, Technical University of Munich, Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Jürgen Richter-Gebert, Technical University of Munich, Germany; **Co-Author:**Silke Schifffhauer, Technische Universität München (TUM), Germany

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Session I 9

14 August 2019 08:30 - 10:00
Seminar Room - S04
ICT Demonstration
Teaching and Teacher Education

Metapholio: A Mobile App for Collaborative Note Taking and Reflection in Teacher Education

Keywords: Educational technology, In-service teacher education, Reflection, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Jeannine Turner, Florida State University, United States

Mobile technologies open up new ways to promote reflection in teacher education. In order to link professional reflection more closely to classroom activities, we have developed the Metapholio app (www.metapholio.ch). The app is designed to collect noticeable moments during teaching practice with multimedia records, to provide prompts for reflection and to encourage discussion between preservice teachers and mentors. Remarkable moments in the classroom can be recorded within the app in the form of text-based memos, photos, audio and video. The records can be created by either preservice teachers themselves or by their mentors. In addition, the app allows preservice teachers to select moments and link them to more overarching written or spoken reflections. Theoretical frameworks and writing instructions are embedded to serve as scaffolds. Peers and mentors can be invited to comment on moments and reflections. Export functionalities allow for preservice teachers to create their own teaching and reflection portfolios. The app tries to incorporate many findings on effective teaching practice, e.g. by supporting professional noticing in-action, scaffolding reflection on-action and by providing a hybrid space for discussion and joint professional development in teacher training.

Metapholio: A Mobile App for Collaborative Note Taking and Reflection in Teacher Education

Presenting Author:Dominik Petko, University of Zurich, Switzerland; **Co-Author:**Regina Schmid, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Laura Müller, Schwyz University of Teacher Education, Switzerland; **Co-Author:**Michael Hielscher, Pädagogische Hochschule Schwyz, Switzerland

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Session I 10

14 August 2019 08:30 - 10:00
Seminar Room - S01

Development and evaluation of a histological e-learning software for medical students

Keywords: E-learning/ Online learning, Educational Psychology, Motivation and emotion, Multimedia learning

Interest group: SIG 06 - Instructional Design

Chairperson: Sabrina Bonanati, Paderborn University, Germany

Histology is an important part of medical education. The microanatomical e-learning software for medical students is an additional offer to complement the lectures and courses of the Anatomical Institute, facilitating interactive learning and repetition of morphological and histological contents. The development of the application is based on theories of multimedia learning such as Clark's and Mayer's (2003) instructional design and the ARCS model of motivation by John Keller (1983). The interactive e-learning program contains different quiz types and various motivational factors such as visual effects, sounds and a changing design of the interface.

A first version of the software was evaluated with a small group of students (N=10) in a cognitive lab. Upon testing and collecting user feedback, a modified version was engineered. The instructional and motivational influence as well as the potential learning progress of the second version will be measured by a randomized pre-test/post-test design with a wait list control group (N=240).

Development and evaluation of a histological e-learning software for medical students

Presenting Author:Christina Drees, Goethe-University Frankfurt, Germany; **Co-Author:**Estifanos Ghebremedhin, Goethe-University Frankfurt, Institute of Anatomy 1, Germany; **Co-Author:**Farid Ayoub, independent, Germany; **Co-Author:**Miriam Hansen, Goethe-Universität Frankfurt, Germany

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Session I 11

14 August 2019 08:30 - 10:00

Seminar Room - S16

ICT Demonstration

Higher Education

The PLAK-in: A flexible tool for digital teacher education and quantitative research

Keywords: Assessment methods and tools, Higher education, Reflection, Survey Research

Interest group: SIG 04 - Higher Education

Chairperson: Philipp Nolden, RWTH Aachen University, Germany

We will present a questionnaire tool "PLAK-in – the LehrAmtsKompass Plug-in", that was developed for accompanying and counselling students in teacher training programs. The requirements for the tool were: easy access for students, login via university account and a "mobile-first" policy for front-end functions. At the same time, we wanted a flexible full functioning questionnaire tool with which the position in the student-life-cycle of the user can be determined and appropriate contents can be offered. The tool is currently in use in teacher education. It supports teacher professional development by offering opportunities for self-reflection.

We will give a hands-on demonstration of both front-end, i.e. student view, and back-end, i.e. functions available for researchers and educators.

The PLAK-in: A flexible tool for digital teacher education and quantitative research

Presenting Author:Sandra Dietrich, University of Leipzig, Germany; **Co-Author:**Andreas Janecek, University of Vienna, Austria; **Co-Author:**Christopher Helf, University of Vienna, Austria; **Co-Author:**Patrick Pazour, University of Vienna, Austria; **Co-Author:**Anna Förster, University of Leipzig, Germany; **Co-Author:**Kristin Stein, Technical University of Dresden, Germany; **Co-Author:**Dorothe Salomo, University of Leipzig, Germany

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Session I 12

14 August 2019 08:30 - 10:00

Seminar Room - S07

ICT Demonstration

Teaching and Teacher Education

The potential of integrated reading and writing lessons: findings from RESTLESS

Keywords: Literacy, Teacher Effectiveness, Teaching/Instruction, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Laura Kerslake, University of Cambridge, United Kingdom

Findings from LAU (Hartmann/Blatt 1990), DESI (Klieme et al. 2006/ Neumann/Lehmann 2008) and NAEP (2012) show that even in higher grades pupils hardly develop their writing skills any further. In their (meta-) studies, Graham/Hebert (2011) and Graham/Harris (2005) come to the conclusion that the use of domain-specific learning strategies can significantly advance the acquisition of competence in the domain. Although learning strategies play a central role in both reading and writing didactics, the integration of reading and writing strategies for didactic settings has not been used yet. For the RESTLESS project, narration was identified as a curriculum relevant text genre, both for writing and reading. Therefore a reading and writing training was developed.

The potential of integrated reading and writing lessons: findings from RESTLESS

Presenting Author:Johannes Wild, Universität Regensburg, Germany; **Co-Author:**Anita Schilcher, University of Regensburg, Germany; **Co-Author:**Christina Knott, University of Regensburg, Germany

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Session I 13

14 August 2019 08:30 - 10:00

Seminar Room - S02

ICT Demonstration

Learning and Instructional Technology

Teaching and testing with data graphs using R-Shiny

Keywords: Comprehension of text and graphics, Computer-assisted learning, E-learning/ Online learning, Instructional design

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Peter Edelsbrunner, ETH Zurich, Switzerland

Literacy with respect to different formats of data graphs is an important educational goal as data graphs can be used to support communication and knowledge acquisition. Whether doing science, learning science, or just reading the news, we are frequently faced with graphical representations of crucial data. We process graphs when making decisions on the stock market, or when receiving the report on a medical procedure. Interdisciplinary work of high social significance (e.g., The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change) often presents a large proportion of information as data graphs. Today there are accessible tools to program web-based interactive data graphs to (1) teach different data graph formats and to (2) teach and test knowledge in different domains (such as learning and forgetting in cognitive psychology or fluctuations of energy market prices). The demonstration will show how R-Shiny can be used to set up respective applications rather easily. Having students fill an emptied chart with a plausible graph can serve as an opportunity to trigger knowledge acquisition. The application can provide the student with automated qualitative feedback based on quantitative characteristics of the drawing. Such approaches allow for efficient feedback in a free-recall format of self-testing. While multiple-choice tests tap recognition knowledge, the graph drawing taps free recall (while still allowing for automated quantification of input quality and for direct automated feedback).

Teaching and testing with data graphs using R-Shiny

Presenting Author:Fang Zhao, University of Hagen, Unknown; **Co-Author:**Robert Gaschler, FernUniversität in Hagen, Germany; **Co-Author:**Veit Kubik, Martin-Luther-Universität Halle-Wittenberg, Germany

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Session I 14

14 August 2019 08:30 - 10:00

Seminar Room - S15

ICT Demonstration

One by One: Two Shiny Web Applications for the Design and Analysis of Single-Case Experiments

Keywords: Design based research, Meta-analysis, Quantitative methods, Technology

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Stefan Markus, University of Wuppertal, Germany

Single-case experimental designs (SCED) are becoming more and more popular in educational and behavioral research. Several methods and software are available for the design and analysis of SCED data, however many of them may not be easy to use for researchers and practitioners. We developed two user-friendly web apps based on the R Shiny platform for the design and analysis of SCEDs. The first application focuses on design, visual analysis and randomization tests for SCEDs. The second application focuses on multilevel modelling of SCED data. In this ICT demonstration, we will introduce participants to SCED data analysis, and then demonstrate both web apps with real data. Both web apps are currently hosted on public servers, and we hope to bridge scientist-practitioner gap with these web apps.

One by One: Two Shiny Web Applications for the Design and Analysis of Single-Case Experiments

Presenting Author:Lies Declercq, KU Leuven, Belgium; **Presenting Author:**Tamal Kumar De, KU Leuven, Belgium; **Co-Author:**Wim Van den Noortgate, KU LEUVEN, Belgium; **Co-Author:**Patrick Onghena, KU Leuven, Belgium

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Session I 15

14 August 2019 08:30 - 10:00

Seminar Room - S14

ICT Demonstration

Learning and Instructional Technology

MINDSTEPS: An Adaptive Computer-Based Tool for Formative Student Assessment

Keywords: Assessment methods and tools, Computer-assisted learning, E-learning/ Online learning, Learning Technologies

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Marwin Felix Löper, Paderborn University, Germany

We demonstrate the application of a computer-based formative assessment system, MINDSTEPS, currently used in four cantons of Switzerland. A distinctive feature of this system is its capability to cover topics and competencies from third grade in primary school through third grade in secondary school, spanning seven years of compulsory schooling. The underlying item bank currently contains between 4,000 and 12,000 items per subject. There are two thematically identical types of item bank: (a) the practice item bank, and (b) the testing item bank. The practice item bank is openly available to all the students for training. Students can autonomously use it to create an assessment from a topic domain they choose or are instructed to choose. The testing item bank can be used by

teachers to evaluate students' learning progress and to identify their strengths and weaknesses in a given content domain. Teachers can select items according to the desired competency domains, single competencies, or curricular topics; they can also create tests that can be taken by students on computers at school. In this ICT demonstration, we will introduce the different use cases of the two items banks. We will start with a demonstration of how new items can be uploaded on the system, how scales can be created from these items, and how new assessments can be defined. We will then show how the system works from the perspective of the students and from the perspective of the teachers and show the various forms of feedback that they receive.

MINDSTEPS: An Adaptive Computer-Based Tool for Formative Student Assessment

Presenting Author:Nina König, University of Zurich, Switzerland; **Co-Author:**Martin J. Tomasik, University of Zurich, Switzerland; **Co-Author:**Stéphanie Berger, University of Zurich, Switzerland; **Co-Author:**Lukas Giesinger, University of Zurich, Switzerland; **Co-Author:**Laura A. Helbling, University of Zurich, Switzerland; **Co-Author:**Urs Moser, University of Zurich, Switzerland

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Session I 16

14 August 2019 08:30 - 10:00

Seminar Room - S13

ICT Demonstration

Learning and Instructional Technology

CohViz-E: A tool to provide novice writers with instructional feedback on the cohesion of their text

Keywords: Computer-assisted learning, E-learning/ Online learning, Technology, Writing/Literacy

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Cyril Brom, Czech Republic

In this ICT demonstration, we will demonstrate CohViz-E, a tool for the provision of instructional feedback on text cohesion, both for researchers and teachers. Writing cohesively is a central skill in crafting comprehensible text, a skill that many novice writers have not sufficiently developed. Although researchers have developed numerous assessment tools for *measuring* the cohesion of expository texts, *instructional* feedback tools are scarce and are only capable to provide feedback on small text units. In this ICT demonstration, we will present a new approach of visual feedback on the cohesion of students' texts, which is capable to process long pieces of texts. CohViz-E can both be used as a web application but also within the R environment to enable researchers and teachers to provide novice writers with feedback on the cohesion of their texts. By demonstrating CohViz-E as a feasible feedback instrument, we aim to encourage researchers and teachers to investigate new ways of providing novice writers with instructional feedback on text cohesion.

CohViz-E: A tool to provide novice writers with instructional feedback on the cohesion of their text

Presenting Author:Christian Burkhart, University of Freiburg, Germany; **Co-Author:**Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

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Session I 17

14 August 2019 08:30 - 10:00

Seminar Room - S06

ICT Demonstration

Assessment and Evaluation

Enrichment of executive functions for small children with SIETTE in TECHCAT project

Keywords: Artificial intelligence, Assessment methods and tools, Cognitive skills, Early childhood education

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Andrea Ximena Castano, Ecuador

Executive Functions are integrative cognitive processes that determine intentional and goal-directed behaviour i.e., they are self-regulatory or executive mental processes through the modulation or control of subordinate processes (motor, attention, verbal, mnemonic, emotional, etc.).

The EF can be enriched with specific tasks, implemented as serious games. The enrichment of executive functions in young children requires the orderly and systematic performance of tasks appropriate to the needs of each child, and a follow-up of their partial results in the short-term and achievements in the long-term. All these aims can be approached with an automatic and adaptive assessment framework that adjusts the tasks to the needs of each child.

In this work we propose an approach to the enrichment of executive functions by using a web-based adaptive assessment tool (SIETTE) configured with classical tasks as serious games. The implemented tasks concern, to date, inhibitory control: write a figure with the finger (motor inhibition); see and say dichotomous values (verbal inhibition); compose a picture (puzzle) with pieces but none fit (emotional inhibition); follow an infinity path (delayed gratification). There are a number of advantages to this approach: (1) it is possible to generate games dynamically, that is, instead of fixed games, responding to configurable parameters; (2) It is possible to apply adaptive computer-based assessment techniques to adjust the difficulty level of the objectives posed to the estimated level of the learner in a particular executive function; (3) Visualization and Data analytics facilitates the evaluation and analysis of the children's cognitive performance.

Enrichment of executive functions for small children with SIETTE in TECHCAT project

Presenting Author:Milagros Fernandez-Molina, University of Malaga, Spain; **Co-Author:**Monica Trella, ETSInformatica, Spain; **Co-Author:**Ricardo Conejo, ETSInformatica, Spain; **Co-Author:**Beatriz Barros, ETSInformatica, Spain

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Session I 18

14 August 2019 08:30 - 10:00

Seminar Room - S09

ICT Demonstration

Learning and Instructional Technology

Augmentation of practice with expert performance data: Presenting a calligraphy use case

Keywords: Instructional design, Learning Technologies, Technology, Vocational education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Liv Ingrid Aske Håberg, Volda University College, Norway

Mentors are crucial for deliberate practice because apprentices does not engage in deliberate practice spontaneously. However, experts are scarce to provide one to one training and typically have more knowledge than they can verbalize, which impedes their capability as a trainer. We argue that augmented reality and sensors along with a proper methodological approach may help in mitigating these problems. We devised a framework based on four components instructional design (4C/ID) model to support the design of training applications which uses the expert performance as training material. To exemplify our argument, we developed the calligraphy application based on the framework, which records calligraphy experts to provide guidance and feedback on the current performance of the apprentice for supporting deliberate practice. This application was built using a Microsoft Surface, Hololens and Myoband™. In this submission, we provide an overview of the operationalization of this framework in form of the calligraphy tutor application.

Augmentation of practice with expert performance data: Presenting a calligraphy use case

Presenting Author:Bibeg Limbu, Open University of the Netherlands, Netherlands; **Co-Author:**Roland Klemke, Open University of the Netherlands, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Marcus Specht, Open University of the Netherlands, Netherlands

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Session I 19

14 August 2019 08:30 - 10:00

Seminar Room - S10

ICT Demonstration

Learning and Instructional Technology

Computer-Based Science Assessments for Crosscutting Concepts

Keywords: Assessment methods and tools, Educational technology, Model-based reasoning, Problem-based learning

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Tine Nielsen, University of Copenhagen, Denmark

Crosscutting Concepts (CCCs) are critical for mastering science since they act as a bridge between disciplinary core ideas (DCIs) and science and engineering practices (SEPs) as presented in the conceptual framework for science education and the Next Generation Science Standards(NGSS). Crosscutting concepts represent knowledge about science and are vital for addressing scientific literacy. Though, they are imperative, crosscutting concepts are often neglected in curriculum, instruction, and assessment due to lack of assessments available to evaluate students' understanding of these concepts. Additionally, crosscutting concepts are difficult to assess with static assessment tools because such assessments make it challenging for students to interact with and engage in phenomenon, modeling, and evidence-based reasoning. To address the lack of valid assessments, validated computer-based summative assessments that focus on the crosscutting concepts of systems and system models and structure/function were developed to probe students' thinking. The simulated assessments supported students' interaction in model-based reasoning. In this presentation we will demonstrate the simulated computer-based assessments that were created to investigate the integration of these crosscutting concepts with three different disciplinary core ideas (e.g. ecosystems, Earth systems, Body systems) as well as, the programmed assessment.

Keywords: Crosscutting concepts, computer-based assessments, systems thinking, model-based reasoning.

Computer-Based Science Assessments for Crosscutting Concepts

Presenting Author:Abeera Rehmat, Indiana University-Bloomington, United States; **Co-Author:**Asmalina Saleh, Indiana University-Bloomington, United States; **Co-Author:**Lei Liu, Educational Testing Service, United States; **Co-Author:**Cindy Hmelo-Silver, Indiana University, United States; **Co-Author:**Gary Weiser, Columbia University: Teachers College, United States; **Co-Author:**Karyn Housh, Indiana University-Bloomington, United States; **Co-Author:**Dante Cisterna-Albuquerque, Educational Testing Service, United States

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Keywords: Crosscutting concepts, computer-based assessments, systems thinking, model-based reasoning.

Session I 20

14 August 2019 08:30 - 10:00
Seminar Room - S03
ICT Demonstration
Learning and Instructional Technology

Learning about and with a social robot: InMoov open-access robot as a learning platform

Keywords: Action research, Artificial intelligence, Case studies, Inquiry learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Eva Lindgren, Umeå University, Sweden

The domain of social robotics has been emerging as an interesting field in contexts ranging from socially assistive robots improving quality of life in e.g. elderly care, to education and customer service (Breazeal, 2004; Breazeal et al., 2008; Axelsson, 2018). To date, there is a manifold of commercial social robots and automation manufacturers. However, social robotics as an entrepreneurial learning and educative process, a makers' culture, has not been studied excessively; this also entails the educational applications of self-built social robots. In this ICT demonstration, we present a social robot and a pilot where the robot was used as a sign language tutor in assisting children with autism to communicate (Axelsson, 2018). The demonstration builds on the pilot and elaborates it further.

The research behind the demonstration explores the learning processes involved on two different levels: First, the development process of the social robot is considered as a combination of creative inquiry-based learning and networked expertise (Hakkarainen et al., 2004). Second, the learning process of the child user of the robot is considered. That is, the pedagogical idea of the robot as supporting the learning is elaborated. We will briefly consider both of these approaches

Learning about and with a social robot: InMoov open-access robot as a learning platform

Presenting Author: Caj Niclas Sandström, University of Helsinki, Finland; **Co-Author:** Olli Ohls, Futurice, Finland; **Co-Author:** Anne Nevgi, University of Helsinki, Finland; **Co-Author:** Kaisu Mälkki, University of Tampere, Finland

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Session I 21

14 August 2019 08:30 - 10:00
Seminar Room - S05
ICT Demonstration
Learning and Instructional Technology

Facilitating Student Peer Review Using Screencast Technology

Keywords: Computer-supported collaborative learning, Learning Technologies, Peer interaction, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Courtney Pollack, United States

Screencast technology allows a student to scroll through a peer's essay onscreen, highlighting or marking up areas of the text while talking. The result is a brief (usually 5-minute) video that the peer can watch and listen to, and replay if necessary. Research on teacher screencast response has shown that, compared to conventional written feedback, screencasts provide far more information in less time, are perceived by students far more positively, create more positive affect, and are more effective instructionally (Author, 2016; Author, 2019). But we have much to learn about the use of screencast technology for *student peer review*. This interactive ICT session will first explain and demonstrate the use of screencast technology for responding to student work. Several student-to-student screencasts used for peer review in foundational (first-year college) writing courses will then be shown and discussed, with the goal of raising implications for training students to use the technology effectively when they provide peer response and to focus on elements of writing that are most conducive to propelling effective revision. Results of a study of 80 student peer-review screencasts will be shared for additional discussion, and resources will be provided.

Facilitating Student Peer Review Using Screencast Technology

Presenting Author: Christopher Anson, North Carolina State University, United States

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Session J 1

14 August 2019 10:15 - 11:45
Seminar Room - S06
SIG Invited Symposium
Culture, Morality, Religion and Education

SIG 13: Intervention studies in civic education based on the VaKE-approach

Keywords: Citizenship education, Learning approaches, Morality, Teaching approaches, Values education

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Eveline Gutzwiller-Helfenfinger, University of Fribourg, Switzerland

Organiser: Alfred Weinberger, Pädagogische Hochschule der Diözese Linz, Austria

Discussant: Hermann J. Abs, University of Duisburg-Essen, Germany

The symposium aims at showing how the VaKE-approach can be applied in different settings of civic education to foster essential learning goals. The constructivist approach VaKE combines values and knowledge education based on moral dilemma discussions and inquiry learning. In the first intervention study VaKE is used in courses aiming at fostering integration of female refugees from Muslim countries in Austria. The results of the behavior-oriented intervention show that refugees implement the learned problem-solving strategies in their daily life. In the second intervention study VaKE is used with teachers who help non-French speaking and newly arrived migrant and traveler pupils to learn French and promote inclusive education in France. The results reveal that through the intervention with VaKE the awareness of the necessity of moral education can be enhanced although teaching practices do not change immediately. In the third intervention study VaKE is applied in higher education in Greece aiming to examine whether undergraduate students perceive particular critical thinking dispositions and critical thinking skills. The results show enhancements in the students' initial critical thinking dispositions. Finally, in the fourth intervention study VaKE is applied in in-service teacher education in Israel. It is shown that the teachers connect the course and the development of civic responsibility. The scientific and educational relevance of this symposium is demonstrated by the practice-based and flexible interventions based on VaKE to foster essential learning goals of civic education.

Promoting Integration of Female Muslim Refugees through VaKE in Civic Education

Presenting Author: Jean-Luc Patry, University of Salzburg, Austria; **Presenting Author:** Natascha Diekmann, University of Salzburg, Austria; **Co-Author:** Sieglinde Weyringer, University of Salzburg, Austria; **Co-Author:** Alfred Weinberger, Pädagogische Hochschule der Diözese Linz, Austria

VaKE is a promising tool to foster integration (Patry et al., 2013; 2016). Therefore, VaKE was used in courses aiming at fostering female refugees from Muslim countries and cultures. Since concrete actions belong to the effort for integration, VaKE was enhanced with a behavior-oriented intervention. 95 Muslim women from different countries participated in one of eleven workshops of three half-days, with the third session about two weeks after the second. Issues were trust-enhancing discussions about identity in the home-country and in the host country (Austria), an adaptation of the VaKE procedure, and a behavioral intervention consisting in the women taking some resolutions what they wanted to change, and reporting its implementation in a notebook. The assessments included, among others, a questionnaire addressing questions about the judgment of the workshop and whether they were able to discriminate between the home country and the host country and between different types of rules (legal, religious, customs and traditions), to implement problem solving strategies, to apply strategies to find problem solving approaches, to implement the action principles as decided. The results show that the evaluation was very positive and that the workshop goals were achieved in every regard for the overwhelming majority (>83%). The women's resolutions are very heterogeneous, the most frequent one dealing with "learning German". The majority of the women filled the notebook quite reliably and complete. Further results are reported. Overall, the workshops can be considered as success, and continuation is recommended.

Exploring civic educational practices through the VaKE-method at the CASNAV center in France

Presenting Author: Frederique Brossard Børhaug, NLA University College, Norway; **Co-Author:** Marco Brighenti, CASNAV Essonne, France; **Co-Author:** Ingvil Brügger Budal, NLA University College, Norway

CASNAV is considered as a best intercultural practice in Europe (Catarci, 2014: 102). The center stands for 'Academic Center for Education of Non-French speaking Newly Arrived and children with migrant background and Traveller pupils (our translation). The key mission of CASNAV teachers is to help newly arrived pupils to learn French and promote inclusive education. These teaching units are called 'UPE2A' classes. The research project aims to help UPE2A teachers to explore their civic educational practices when helping the pupils to reflect critically on the values of the French Republic and increase their language abilities in French through the VaKE-method.

The data collection was achieved through questionnaires, audio recordings of plenum discussions with UPE2A teachers and class observations throughout 2016-2018. Results show that moral education seems to be considered just as necessary as knowledge education by the UPE2A teachers; yet, we noticed the absence of an explicit methodology for moral education. However, the rising awareness about the necessity of moral education at first did not imply a major change in their teaching practices, and we perceived some anxiety in the teachers' pedagogical approach. The shift from knowledge-regulating authority to a multi-tasked moderating position also fed initially fears of losing power and control over the multicultural class, and fear of controversy on issues related to secularism and culture/religion. The mentoring role from the researchers became an essential part during the research project. Nonetheless, dilemma VaKE-stories were implemented in class and contributed to raise complex civic issues (arranged/forced marriage, bodily integrity, religion).

Critical Thinking in Civic Education: An intervention with VaKE in Higher Education

Presenting Author: Dimitris Pnevmatikos, University of Western Macedonia, Greece; **Co-Author:** Panagiota Chrsitodoulou, University of Western Macedonia, Greece; **Co-Author:** Triantafyllia Georgiadou, University of Western Macedonia, Greece

Critical Thinking is an essential aspect of the competencies future citizens need for active and responsible participation in society, and alongside with values among the priorities of education for the 21st century. Teaching for promoting Critical Thinking is a challenging task for instructors at different educational levels. In the current study, we examined whether the employment of the Values and Knowledge Education methodology in the course, in parallel with the knowledge acquisition, could trigger students to activate particular Critical Thinking Skills and Critical Thinking Dispositions. Twenty-seven undergraduate students participated in the study. The intervention consisted of three sessions with a two-hour duration per session for three weeks. An appropriate VaKE dilemma was designed to address Maslow's theory of motivation regarding knowledge education-a content compatible with the course's curriculum. Students described their perceived experiences in structured diaries, which they completed after each session. Findings suggest that students could identify and justify experiences related to activation of Critical Thinking Skills as well as to report changes in their initial Critical Thinking Dispositions. Results are discussed regarding the VaKE method's educational significance towards the preparation of active citizens who will transform their societies.

The use of moral dilemmas in order to promote civic responsibility in teacher education

Presenting Author: Roxana Reichman, Gordon Academic College, Israel

In the 21st century, in what Shapiro & Gross (2008) call turbulent times, the Western world is faced with multiple challenges. In order to fight extremism of all sort, schools and institutions of higher education need to foster conflict resolution skills, critical and creative thinking and teamwork. The use of moral dilemmas force them not to think in terms of black and white. Shapiro & Gross (2013) suggest a multiple ethic paradigm which includes ethic of care, ethic of critique, ethic of profession and ethic of justice.

VaKE provides an interesting model of teaching with moral dilemmas (Patry et al, 2017) and it offers flexibility and can be adapted in different ways. One such variation of VaKE is the Dilemma Based Model (DBM), which was used in two institutions of teacher education in Israel in order to promote civic responsibility and democracy (Reichman, 2018). This study presents the use of these two didactic tools for dealing with conflicts in the Israeli society.

248 pre-service and in-service teachers in two institutions were exposed to DBM in undergraduate and graduate courses, as well as in two workshops given for mentors of civic education teachers. They were confronted with a dilemma regarding people who have entered Israel illegally. The feedback questionnaires reveal that 92% to 94% of the respondents from all groups agreed with statements regarding the connection between the course and the development of civil responsibility, the interest in the subjects and the clarity of the objectives.

Session J 2

14 August 2019 10:15 - 11:45

Beliefs about educational psychology: Status quo and preventing misconceptions and science denial

Keywords: Attitudes and beliefs, Conceptual change, Educational Psychology, Misconceptions, Pre-service teacher education

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Eva Seifried, Heidelberg University, Germany

Discussant: Tobias Richter, University of Würzburg, Germany

Lately, psychology's status as a science has been questioned (e.g., Lilienfeld, 2012). How preservice teachers perceive psychology is particularly interesting because they will act as distributors of knowledge and are obliged to use scientific methods for their teaching. Therefore, it is important that preservice teachers perceive (educational) psychology as scientific, and do not endorse misconceptions regarding educational topics. Furthermore, they should recognize pseudo-scientific arguments to prepare their students to resist pseudo-scientific rhetoric. This symposium combines recent research on the general perception of educational psychology, the prevalence of specific misconceptions among preservice teachers, and ideas on how to resist pseudo-science: The first presentation starts on a general level by reflecting on preservice teachers' epistemological beliefs about educational psychology. The second and the third contributions focus on specific topics from educational psychology, reporting the validation of a questionnaire and the prevalence and endurance of misconceptions among preservice teachers. The fourth presentation concentrates on an intervention to recognize pseudo-scientific arguments. The studies will be discussed by an expert in the fields of teacher education and scientific literacy. Overall, the symposium addresses the current issues of science perception and denial, thereby emphasizing the important role of preservice teachers: If they accepted educational psychology as scientific, held no misconceptions and knew how to detect pseudo-scientific arguments, they could consider these aspects in their teaching and pass them on to their students. Lilienfeld, S. O. (2012). Public skepticism of psychology: Why many people perceive the study of human behavior as unscientific. *American Psychologist*, 67, 111–129.

Change of knowledge and epistemological beliefs about educational psychology in preservice teachers

Presenting Author: Joerg Zumbach, University of Salzburg, Austria; **Presenting Author:** Ines Deibl, University of Salzburg, Austria; **Co-Author:** Viola Maria Geiger, Universität Salzburg, Austria; **Co-Author:** Daniela Martinek, University of Salzburg, Austria

The present study examines the development of preservice teachers' epistemological beliefs and knowledge about genuine fields of educational psychology. Based on the observation that many preservice teachers have no or little knowledge about or even prejudices related to educational psychology, we analyzed how this knowledge and attitudes change during the curriculum. Therefore, we developed a questionnaire that measures epistemological beliefs of preservice teachers about the nature of educational psychology. We analyzed how students differ in their beliefs at the rather beginning of their academic program and at its end. The questionnaire consists of seven subscales: Scholarly Standard Practice, Relevance of the Discipline, Scientific Quality, Usefulness, Source of Knowing, Certainty of Knowledge, and Mandatory Character of the Course. Further, we measured students' domain knowledge (via Content Assessment) within the domain of educational psychology. Results reveal that students at the end of the program judge the Usefulness and the Relevance of educational psychology for their profession significantly higher than beginners. They also judge the Source of Knowing as more reliable than beginners and identify more genuine fields of the discipline correctly. Nevertheless, Certainty of Knowledge decreases during the program and the judgments about the scientific quality of educational psychology do not change during the years. These findings implicate that there is still a high potential to stress the importance of this field in teacher training and to create awareness not only for its practical use but also for the basic mechanisms and credibility of underlying research.

Measuring misconceptions in (teacher) education: The Questionable Beliefs in Education Scale

Presenting Author: Jana Asberger, University of Erfurt, Germany; **Co-Author:** Eva Thomm, University of Erfurt, Germany; **Co-Author:** Johannes Bauer, University of Erfurt, Germany

Students in teacher education and educationally relevant disciplines frequently have questionable or false beliefs about school-related topics. Such home-grown and deeply rooted misconceptions may hamper the reception and use of evidence-based content in teacher education. This study delivers results from a first evaluation of the Questionable Beliefs in Education Scale (QUEBEC). The questionnaire assesses misconceptions regarding four exemplary educational topics on which students frequently endorse beliefs that conflict with research (i.e., class size effects, grade retention effects, effectiveness of direct instruction, and effects of the proportion of female staff in elementary and primary education). Data were gathered from $N = 217$ students from education-related and other disciplines. Factor analyses confirmed the scale's four-factor-structure that aligns the four selected topics, and indicated measurement invariance over groups of pre-service teachers and students of further disciplines. The subscales largely showed good reliability (McDonald's W^3 .70). Only one scale indicated marginally acceptable reliability. Direct comparison revealed differences between pre-service teachers and other students. For instance, pre-service teachers endorsed misconceptions related to direct instruction less strongly, and misconceptions related to grade retention more strongly than students studying educational science or psychology. As compared to students from non-educational domains, preservice teachers agreed less with misconceptions about class size and direct instruction. Overall, the QUEBEC seems to provide a promising instrument for screening typical misconceptions related to education. This may be helpful for addressing such misconceptions in university courses and for breaking the ground for conceptual change.

Prevalence and reduction of educational psychological misconceptions among preservice teachers

Presenting Author: Cordelia Menz, Heidelberg University, Germany; **Co-Author:** Birgit Spinath, Heidelberg University, Germany; **Co-Author:** Eva Seifried, Heidelberg University, Germany

Misconceptions about topics from educational psychology among (preservice) teachers can be a threat for reaching educational goals. Therefore, both the prevalence of such educational psychological misconceptions and whether they can be reduced are of societal interest: In this study, we analyzed whether and to what extent preservice teachers in Germany hold misconceptions about topics from educational psychology. Furthermore, we concentrated on whether these misconceptions can be reduced through refutation-style texts, which either present the current status of research in an empirical or an anecdotal version. Prevalence and refutability of misconceptions were analyzed among $N = 937$ German preservice teachers who participated in an online-survey. Results indicated a high prevalence of educational psychological misconceptions, a possible reduction of misconceptions through refutation-style texts in general, and a stronger reduction through empirical than anecdotal evidence. However, only few preservice teachers endorsing misconceptions showed rigorous shifts of their opinions after reading the refutation-style texts. We conclude that educational psychological misconceptions regarding different topics are common among German preservice teachers and that presenting empirical evidence is not enough to counteract misconceptions efficiently. Future research should deepen the understanding of why and wherefrom these misconceptions occur, extend investigations to further topics from educational psychology and concentrate on efficient interventions to counteract misconceptions among preservice teachers.

Fostering resilience against science denial: Inoculation against incoherence

Presenting Author: Eva Seifried, Heidelberg University, Germany; **Co-Author:** Stephan Lewandowsky, University of Bristol, United Kingdom

Some well-established scientific propositions that are no longer debated by the scientific community may become subject to opposition by politically-motivated actors if the findings have adverse implications for vested interests. For example, even though there is no longer any scientific debate about the fact that the world's climate is changing from greenhouse gas emissions, vested interests and political groupings continue to deny the science. Analysis of the rhetorical techniques used in denial reveals that talking points are often incoherent. In this study, participants were trained to detect incoherence of argumentation through a 3-minute video, followed by several practice items involving typical denialist talking points. After completion of practice, people's attitudes towards two scientific issues (vaccinations and climate change) were found to have been boosted by incoherence-detection training and subsequent practice.

Session J 3

Supporting spontaneous mathematical activities: Context and interventions

Keywords: Cognitive development, Early childhood education, Informal learning, Mathematics, Numeracy, Primary education, Qualitative methods, Student learning

Interest group:

Chairperson: Minna M Hannula-Sormunen, University of Turku, Finland

Organiser: Jake McMullen, University of Turku, Finland

Organiser: Minna M Hannula-Sormunen, University of Turku, Finland

Discussant: Markku Hannula, University of Helsinki, Finland

Recent research has revealed differences in tendencies of children to focus on mathematical aspects in everyday situations when not guided to do so. These differences in spontaneous mathematical focusing tendencies have been found to predict mathematical development in children from pre-school age to lower secondary school. For example, children's tendency of Spontaneous Focusing On Numerosity (SFON) has been found to predict individual differences in early numeracy and mathematical development throughout primary school. Although SFON and related tendencies have been extensively studied in cross-sectional and longitudinal correlational studies, there has been less research aimed at examining how contextual and instructional factors may influence these tendencies. This symposium includes four such empirical studies which build on the previous findings of SFON studies by examining factors that impact students own self-initiated mathematical activities. The first contribution examines the effectiveness of an intervention aimed at enhancing SFON tendency and cardinality skills, in early childhood educational settings. The second examines the factors that influence the effectiveness of a short SFON tendency intervention, especially the factors that influence parent-child mathematical interactions. The third contribution details the nature of young children's mathematical activities in daycare setting: comparing free-play with more structured activities. The final contribution details an instructional intervention aim at enhancing older children's tendency to spontaneously focus on multiplicative relations in late primary school. In total, this collection of studies suggests that uncovering and modeling mathematical aspects of children's everyday surroundings could be an effective tool for promoting children's mathematical development.

Increasing Math Talk During Play in a Children's Museum: The Role of Parent and Child Factors

Presenting Author: Melissa Libertus, University of Pittsburgh, United States; **Co-Author:** Emily Braham, University of Pittsburgh, United States; **Co-Author:** Koleen McCrink, Columbia University, United States

Previous research has demonstrated that parents' and teachers' talk about numbers and other math concepts ("math talk") predicts young children's math abilities. However, little is known about why some parents use more math talk than others and what role child factors play. In this study, our goals were to 1) examine if prompts in a children's museum could promote math-related conversations between parents and children and, 2) examine how characteristics of the parent-child dyad influence these interactions. Parents were told to help their child shop for a meal on a \$20-budget or for a healthy meal. As expected, parents and children used more math talk when pretending to shop on a budget. Importantly, parents' math anxiety and children's understanding of cardinality were significant predictors of parents' and children's math talk during the interactions suggesting that these factors need to be considered when designing interventions to promote math-related play.

Understanding mathematical reasoning at preschool level through epistemological moves

Presenting Author: Tomi Kärki, University of Turku, Finland; **Co-Author:** Lovisa Sumpter, Stockholm University, Sweden; **Co-Author:** Maria Hedefalk, Uppsala University, Sweden

We focus on preschool children's mathematical reasoning and the interaction between children and their preschool teachers. Eleven preschool participated in the project and the data consisted of video filmed interactions in mathematical situations. Using two frameworks, one about the mathematical content and structure of reasoning and one focusing on teachers' epistemological moves, the analysis of the data show that different types of epistemological moves are connected to the different types of or the lack of mathematical arguments in the reasoning. The teachers initiated several task situations, both planned or in free play, and in most often cases the emphasis was on confirming the reached conclusions. Comparing our results with previous similar studies, we see that in free play without teachers involved children formulate mathematical arguments, but in those where the teacher was an active participant, such mathematical arguments were most likely generated by the teacher themselves independent if the situation was free play or a planned activity. Some implications especially for teacher education are discussed.

Enhancing students' spontaneous focusing on multiplicative relations

Presenting Author: Saku Määttä, University of Turku, Finland; **Co-Author:** Minna M Hannula-Sormunen, University of Turku, Finland; **Co-Author:** Erno Lehtinen, University of Turku, Finland; **Co-Author:** Jake McMullen, University of Turku, Finland

Spontaneous focusing on quantitative relations (SFOR) has been shown to be a strong predictor of rational number conceptual development in late primary school. The present study outlines an intervention program that examines the possibilities to enhance late primary school students' SFOR tendency. The intervention program allowed students to explore and identify quantitative relations from their everyday environment, including situations outside of the classroom. Thirteen-year-olds ($n=38$) from two classrooms participated in the seven-week long quasi-experimental study. One classroom spent five lessons over five weeks participating in activities which involved uncovering, defining, and describing multiplicative relations in their everyday surroundings. In comparison to a business-as-usual control group, results show the intervention to be successful in enhancing SFOR tendency. These results suggest that it is possible to utilize mobile technologies to enhance students' awareness of the possibilities to use quantitative relations as explicit targets of focusing and reasoning in non-explicitly mathematical situations.

Stimulation of SFON and cardinality and counting skills at day care

Presenting Author: Minna M Hannula-Sormunen, University of Turku, Finland; **Co-Author:** Cristina Nanu, University of Turku, Finland; **Co-Author:** Milja Heinonen, University of Turku, Finland; **Co-Author:** Anne Sorariutta, University of Turku, Finland; **Co-Author:** Ilona Södervik, University of Helsinki, Finland; **Co-Author:** Aino Mattinen, University of Turku, Finland

This presentation describes a set of two naturalistic 2 - 5 -year-old children's intervention studies aimed at promoting children's Spontaneous Focusing On Numerosity (SFON) and early numerical skills. The enhancement activities were conducted by early educators in their day-care centres in both small-group and whole group settings. The study consisted of a quasi-experimental pretest-posttest design with a delayed posttest and an active control group. The intervention was conducted as a professional development program for the early educators. All conditions had 6 weeks of intensive training phase including 3 small-group sessions combined with whole group special transfer activities in each week, followed by 4-month rehearsal phase when intervention activities were integrated to normal daycare. The results show the experimental group developed more than the control group cardinality related skills in both studies. The SFON tendency increased more from pre to post-test in both studies, but the group differences vanished to the delayed post-test. There were no group differences in vocabulary or story comprehension skills. Educational implications suggest that combining SFON and cardinality related skill training at daycare results developmentally effective activities for early educators and children.

Session J 4

14 August 2019 10:15 - 11:45

Lecture Hall - H08

Symposium

Instructional Design, Learning and Social Interaction, Motivational, Social and Affective Processes

Homework: The Roles of Students, Parents, and Teachers on its Effectiveness

Keywords: Achievement, Case studies, Educational Psychology, Mathematics, Motivation, Parental involvement in learning, Primary education, Quantitative methods, School effectiveness, Secondary education, Self-regulation, Student learning, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition, SIG 18 - Educational Effectiveness

Chairperson: Eriko Ota, University of Tokyo, Japan

Discussant: Hanna Dumont, Germany

Homework assignment is one of the most controversial issues in education. In the last decades, educational psychologists have conducted a number of empirical studies and meta-analyses to reveal its general effectiveness. However, the effect of homework depends on various conditions such as students' characteristics, parental involvement, and teacher instructions. Thus, to make the most of homework potential, it is important to explore the possible roles of those three agents on homework. The proposed symposium presents empirical studies from several different countries, which provide meaningful suggestions for elaboration of the existing homework literature and current educational practices. The first paper (Spain) addresses student roles based on a person-centered approach, and it shows that both the quantity (i.e., time spent on homework) and quality (i.e., time management) of learning define subsequent academic performance. The second paper (Spain) also examines student roles considering both motivational and behavioral aspects of homework. It demonstrates that we should consider motivational and behavioral variables when discussing the relationship between homework and academic achievement. The third paper (Estonia and Finland) then reveals how parental involvement affects students' homework behavior and, as a consequence, academic outcomes. The final paper (Japan) focuses more on teacher roles that could affect students' cognitive processes of learning during homework and describes one teacher's instructional effort that successfully facilitated effective strategy use. Finally, the discussant (Germany) will summarize these findings and provide an outline for future research and educational practices.

Homework Time and Homework Time Management Relationship: A Person-Centered Approach

Presenting Author: Trinidad Garcia, University of Oviedo, Spain; **Co-Author:** José Carlos Núñez, University of Oviedo, Spain; **Co-Author:** Pedro Rosário, University of Minho, Portugal; **Co-Author:** Natalia Suárez Fernández, University of Oviedo, Spain; **Co-Author:** Carmen Díez, University of Oviedo, Spain

Aims. Based on a person-centered approach, this study seeks to analyze the relevance of time spent on homework completion when observed in the interaction with other variables of interest, such as time management. **Methodology.** Reports from 571 students (5th and 6th grades) were analyzed by means of Latent Profile Analysis. The profiles obtained were compared in terms of the amount of homework completed (of those tasks prescribed by teachers), the quality of the homework completed, and academic performance. **Findings.** The results obtained suggest three types of profiles: potentially very effective students (characterized by those who do not spend little time performing the homework but show good time management), potentially very ineffective students (characterized by using more time to the average and having very poor time management), and average efficiency students (average performance time and time management). The most effective students are those who obtain the highest mathematical performance and perform most homework (of those prescribed), and of the highest quality. Theoretical and educational significance of the research. Results from the present study support the need for a change in the field of homework research, based on a more person-centered approach rather than on the task. On the other hand, our findings also show the importance of including specific training on self-regulated learning skills as a part of the daily teaching/learning process.

Homework: Variables Predicting Academic Achievement in Secondary Students

Presenting Author: Bibiana Regueiro, University of A Coruña, Spain; **Co-Author:** Antonio Valle, Universidad de La Coruña, Spain; **Co-Author:** Susana Rodríguez, Universidad de La Coruña, Spain; **Co-Author:** Isabel Piñeiro, Universidad de La Coruña, Spain; **Co-Author:** Iris Estévez, Universidad de La Coruña, Spain

The empirical findings about the relationship between homework and achievement have been inconsistent, so a model is proposed differentiating between motivational and behavioral variables to gauge the explanatory potential of each of these variables in the prediction of academic achievement and the pattern of interaction between the predictor variables included in this study. The study involved 730 students belonging to 11 educational centers of secondary education in northern Spain. Results indicate the number of homework assignments predicts positively and significantly academic achievement: the greater the amount of homework completed (from the total set assigned), the better academic achievement. Therefore, when considering the relationship between homework and academic achievement, time spent on homework and time management are important variables that explain better performance of homework, and this, in turn, explains students' academic achievement. The results confirm that intrinsic motivation and the perception of utility affect students' commitment to homework and that together, both motivational and behavioral aspects affect academic achievement.

Math Homework in Middle School: Parental Help and Children's Academic Outcomes

Presenting Author: Eve Kikas, Tallinn University, Estonia; **Co-Author:** Gintautas Silinskas, University of Jyväskylä, Finland

In the present study, we examined the longitudinal relations between child-perceived parental help in math homework (i.e., support and control), children's math skills, and mother-reported task-persistent behavior in homework situations. A total of 624 mother-child dyads were followed across Grade 6 (T1) and Grade 9 (T2), controlling for Grade 3 (T0) variables. At each measurement point, children completed math tests, and their mothers evaluated task persistence during homework. In Grades 6 and 9, children reported their perceptions of their parents' help in math homework. First, the results showed that perceived support in Grade 6 predicted an increase in child persistence during homework in Grade 9. Second, math skills in Grade 6 predicted an increase in perceived support in Grade 9. In addition, poor math skills in Grade 3 predicted an increase in perceived control in Grade 6. Finally, perceived control in Grade 6 predicted higher levels of perceived support in Grade 9. Overall, the results suggest that math skills in particular trigger certain types of parental help in children's homework. In addition, a positive type of help in children's homework—perceived autonomy-support—relates to motivational aspects of academic outcomes (i.e., task persistence in homework situations).

Promoting Elementary School Students' Self-Regulated Learning through Homework

Presenting Author: Eriko Ota, University of Tokyo, Japan; **Co-Author:** Tetsumi Hamamoto, Public Elementary School, Japan

Homework is an instructional activity which can potentially promote students' self-regulated learning. However, when teachers assign homework, they often encounter students' motivational, behavioral, and cognitive problems. Previous research studies have proposed some of the implications of these problems, but they have mainly focused on motivational and/or behavioral aspects such as homework effort. Thus, it is still unclear how to promote better quality of learning through homework from a cognitive perspective. We conducted a case study in an elementary school and examined how we could facilitate students' cognitive and metacognitive strategy use in the self-regulatory process of undertaking homework. The intervention comprised of 3 instructional phases: (i) implementing a new type of homework called "inquiry at home", (ii) linking what students learned in lessons with the following homework using self-reflection at the end of each class, (iii) linking what they did in homework with the following lessons utilizing collaborative learning at the beginning of each class. Analysis of learning strategies in homework descriptions revealed that participants (5th graders, $n = 38$) gradually improved their use of strategies, which appeared to result from the instructions and guidance we provided. This study proposes the importance of "linking" in considering both homework models/theory and educational practices.

Session J 5

14 August 2019 10:15 - 11:45

Lecture Hall - H07

Symposium

Teaching and Teacher Education

Family-school partnerships: The conditions and benefits for the teachers, students and parents

Keywords: Achievement, Early childhood education, Motivation, Parental involvement in learning, Quantitative methods, Secondary education, Social

interaction, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Sittipan Yotyodying, FernUniversität in Hagen, Germany

Organiser: Sittipan Yotyodying, FernUniversität in Hagen, Germany

Organiser: Charlott Rubach, University of Potsdam, Germany

Discussant: Markus P. Neuenschwander, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Epstein's overlapping spheres of influences model (Epstein, 1987) is one of the most influential theoretical frameworks to explain processes in family-school partnerships (FSP). In detail, the model postulates that schools and families are the most important institutions of socialization for students, justified for the reason that they promote students' academic success. Building upon Epstein's model, the concept of FSP—an active collaboration characterized by equal rights and duties between parents and teachers—includes also benefits for parents and teachers and depends on different conditions (e.g., Ames, Khoju, & Watkins, 1993; Kraft & Dougherty, 2013; Lim, 2008). Next to this fact, in Anglo-American schools, FSP is implemented in school life in order to ensure students' learning and their development in school. Based on this theoretical framework and previous findings, this symposium will provide a more insight into the mechanism of FSP in the European school context, where the concept of FSP has been much less investigated to date. By doing so, we focus on two research questions: (a) Which factors can influence FSP and (b) what are benefits of FSP for the students, parents, and teachers? Together, four papers—three from Germany and one from Portugal—will be presented in this symposium. Based on the results in both countries, we will discuss relevant conditions of FSP, possible benefits for students, parents, and teachers as well as theoretical and practical implications.

Teachers' prosocialness and well-being: Mediated by teacher engagement in family-school partnerships

Presenting Author:Sittipan Yotyodying, FernUniversität in Hagen, Germany; **Co-Author:**Swantje Dettmers, FernUniversität in Hagen, Germany; **Co-Author:**Kathrin Jonkmann, FernUniversität in Hagen, Germany

Based on self-determination theory, several studies have shown that people's pro-sociality is connected to the enhancement of their own well-being and this connection is mediated by basic needs satisfaction: needs for autonomy, for competence, and for social-relatedness. To our knowledge, this connection has not been tested in the school context that yet. The aim of this study was to examine whether teachers' pro-sociality would be positively associated with their professional well-being (i.e., job satisfaction and work-related self-esteem). Moreover, we proposed that pro-socially oriented teachers become more engaged in activities that promote positive social relationships at work such as positive family-school partnerships (FSP), thereby enhancing their sense of social-relatedness. We therefore examined, as the secondary issue, whether the connection between teachers' pro-sociality and their professional well-being would be mediated by teacher engagement in FSP activities. Using the conceptual framework of strong FSP in German schools (Sacher et al., 2013), as developed on the basis of PTA's Standards for FSP, we assessed various and respectful family-school communication and family-school cooperation for supporting children's school success as important aspects of teacher engagement in FSP activities. A total of 218 teachers (72% females; 65% from secondary schools; M age = 44.78, SD = 12.07) had participated in a cross-sectional survey. In line with self-determination theory, teachers' perceived greater pro-sociality was associated with greater professional well-being. As expected, this connection was partially mediated by teacher engagement in FSP activities. Findings and implications of this study are discussed.

Interplay among family-school partnerships, support from parents and teachers and student motivation

Presenting Author:Denise Kücholl, Schulpädagogik Universität Potsdam, Germany; **Co-Author:**Charlott Rubach, University of Potsdam, Germany; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany

Many studies have shown that family-school partnerships (FSP) and the support from parents and teachers are relevant conditions to foster students' academic success. However, students' perspectives on FSP are often unconsidered. Therefore, this study examined in what extent student-perceived FSP is related to student-perceived support from parents and teachers and whether the student-perceived support from teachers and parents is related to students' intrinsic motivation and school-related utility value. Structural equation models were applied using student data of the German longitudinal '*Motivation and Learning in Mathematics*' study (Lazarides & Rubach, 2015-2017). This study focused on a subsample of 370 ninth and tenth graders (52.7% girls) in German secondary schools. Our analyses showed that student-perceived FSP is positively related to student-perceived support from parents and teachers. Student-perceived teacher support, in turn, was positively related to students' intrinsic motivation and parent support to utility value.

Real and ideal teacher-family partnership practices in childcare

Presenting Author:Vera Coelho, Porto University, FPCE, Portugal; **Co-Author:**Sílvia de Barros, Politécnico do Porto, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal; **Co-Author:**Manuela Pessanha, Polytechnic Institute of Porto, Portugal; **Co-Author:**Carla Peixoto, Polytechnic Institute of Porto, Portugal; **Co-Author:**Ana Isabel Mota e Costa Pinto, University of Porto - Portugal, Portugal

Teacher-family partnership has been identified as a crucial element of high-quality programs for infants/toddlers, and relations between such partnerships and children's positive outcomes are highlighted in literature. Nevertheless, there is a need for a better understanding of what teacher-family partnership involves when educating and caring for infants (Elicker et al., 2010). This paper describes teachers' and mothers' reports of real and ideal partnership practices during infant childcare attendance. Moreover, teachers and mothers reports are compared in order to explore their attunement regarding partnership practices. Finally, we explore child (e.g., temperament), childcare (e.g., quality of interactions) and family (e.g., home quality) level predictors of partnership. Mothers and teachers of 90 infants answered the Real-Ideal Teacher-Parents Partnership Scale: Childcare (Gaspar, 1996). Classroom quality was assessed with the CLASS-Infants (Hamre, et al., 2014), home quality with the HOME scale (Caldwell & Bradley, 1984), and child temperament with the Infant Behavior Questionnaire (Rothbart, 1981). Results show that both parents and teachers report a reasonable number of partnership practices being implemented for meeting child needs. Nevertheless, they seem to recognize the importance of stronger partnerships by reporting that ideal collaborations would include a significant higher number of practices than those being implemented. Teachers tend to report more practices than parents. Among the explored predictors, teachers' having a university degree in education was a significant predictor of real and ideal partnership practices. Given the importance of teacher-family partnership, discussion highlights the relevance of identifying as ways to increase partnerships.

Do family-school partnerships contribute to student outcomes? Mediated by homework involvement

Presenting Author:Swantje Dettmers, FernUniversität in Hagen, Germany; **Co-Author:**Sittipan Yotyodying, FernUniversität in Hagen, Germany; **Co-Author:**Kathrin Jonkmann, FernUniversität in Hagen, Germany

Given the importance of improving parental involvement, scholars have attempted to identify variables that increase beneficial forms of parental involvement. Besides parental characteristics, a number of studies demonstrated that positive family-school partnerships (FSP), especially an effective family-school communication, may help to enhance parental involvement at home. However, it remains unclear whether FSP would also predict different qualities of parental homework involvement. In this paper, we examined FSP as a predictor of parental homework involvement and its consequential relations with three student outcomes: mathematics performance, school reluctance, and well-being in the family. The mediating role of parental homework involvement was also addressed. Taking a self-determination theory perspective on parental need support, the quality of parental homework involvement was operationally defined by two dimensions of parental supportive behavior: autonomy- and competence-supportive homework involvement. Analyses of this paper were based on the data of 189 parents (82% mothers) of school students (52% girls). Parents reported on their perceptions of FSP, their homework involvement, and their children's school-related outcomes. As expected, a structural equation modeling analysis—after controlling for parental SES—revealed a positive relation between FSP and the quality of parental homework involvement that was, in turn, positively associated with mathematics performance and well-being in the family, but negatively associated with school reluctance. As for the mediation issue, it was found that the quality of parental homework involvement mediated the relations of FSP to well-being in the family and to school reluctance. Results and implications of this study are discussed.

Session J 6

14 August 2019 10:15 - 11:45

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Instructional Design, Learning and Instructional Technology

The Role of Haptic Information in Multimodal Learning Environments

Keywords: Computer-assisted learning, Early childhood education, Educational Psychology, Educational technology, Informal learning, Instructional design, Mathematics, Multimedia learning, Primary education, Science education

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Jennifer Mueller, Leibniz-Institut für Wissensmedien, Germany

Chairperson: Magdalena Novak, Leibniz-Institut für Wissensmedien, Germany

Organiser: Jennifer Mueller, Leibniz-Institut für Wissensmedien, Germany

Organiser: Magdalena Novak, Leibniz-Institut für Wissensmedien, Germany

Discussant: Paul Ginns, The University of Sydney, Australia

Multimodal learning environments such as touch-based tablet-applications or interactive exhibits in science museums do not only offer visual and auditory but also haptic information for learners. In the history of research on multimedia learning, the roles of visual and auditory information for learning processes have been extensively studied. On the contrary, research on the role of haptic information for learning is rare. Therefore, this symposium integrates research on the design, application, and evaluation of teaching and learning methods for different age groups, which provide haptic information. The first contribution will address the question of whether the presence of haptic sensory feedback affects kindergarten student's learning in three different science domains. The second paper will discuss research on an interdisciplinary technological development project focusing on multisensory technologies for teaching math to primary school children. The third contribution will present the outcomes of the evaluation of an integrated music and math course, which uses tangibles to simultaneously enhance fourth graders' musical and mathematical skills. And the last paper will report findings on the influence of the haptic exploration of real objects on adults' learning experiences and outcomes in an exhibition. This symposium will end with a discussion focusing on further strategies to implement haptic information for learning and instruction in a meaningful way.

Teaching Musical Concepts With Tangibles Can Improve Fraction Understanding in Fourth Graders

Presenting Author: Jennifer Mueller, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Uwe Oestermeier, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:** Jessika Golle, University of Tuebingen, Germany; **Co-Author:** Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:** Peter Gerjets, Leibniz-Institut für Wissensmedien (IWM), Germany

Tangibles, i.e., physical objects enriched by digital information, bear great potential for teaching abstract concepts. Their ability to map different concepts onto one physical object (e.g., relative sound duration vs. fraction) could also facilitate the transfer of learning gains between different domains (e.g. music and math). However, methods on how to use tangibles in schools and also empirical evidence for their efficacy are rare. In this study, a music composition course using tangibles, a music application, and a multi-touch table was designed and implemented at 28 primary schools offering extracurricular courses. A randomized, waiting group controlled evaluation study revealed that at posttest participating children outperformed children of the waiting group in fraction magnitude comparison and fraction addition tasks, although fraction comparison and fraction addition were not part of course curriculum. Further studies that will help to narrow down the contributions of the tangibles and especially their haptic properties for the transfer effect found will be discussed.

The Impact of the Presence/Absence of Haptic Feedback on Kindergarten Students' Science Learning

Presenting Author: Tasos Hovardas, University of Cyprus, Cyprus; **Co-Author:** Marios Papaevripidou, University of Cyprus, Cyprus; **Co-Author:** Zacharias Zacharia, University of Cyprus, Cyprus; **Co-Author:** Eleftheria Panteli, University of Cyprus, Cyprus; **Co-Author:** Yvoni Pavlou, University of Cyprus, Cyprus

The purpose of this study was to investigate whether the presence of haptic sensory feedback affects kindergarten students' learning in three science domains (D1: beam balance, D2: sinking/floating, D3: springs) during experimentation. In so doing, we compared students' use of Physical (PM) and Virtual Manipulatives (VM). The participants were 44 preschoolers (age mean= 5,7) who were equally separated into two conditions according to the type of experimentation (PM or VM) they used during a semi-structured interview for each of the three domains. The interview involved three phases (initial evaluation, experimentation, final evaluation), which followed the Predict-Observe-Explain strategy. Data were collected through clinical interviews (one per domain per condition) and analyzed qualitatively and quantitatively. Findings revealed that in D1 the haptic input did not differentiate PM and VM students' understanding of the function of the beam. In D2 the haptic input appeared to have a negative effect on PM students' learning. Feeling the weight of a mass strengthen PM students' misconception that heavier objects always sink, whereas the scientifically correct idea that the material of an object determines its sinking/floating behavior in the water was found to be significantly higher among the VM students than the PM ones. In D3 the PM students outperformed significantly the VM students with regard to the idea that the heavier an object is the more the spring will expand, indicating that the haptic input experienced by the PM students served as an advantage to their learning. Lastly, we discuss the practical implications of these findings.

Multisensory Technologies for Embodied and Enactive Learning

Presenting Author: Gualtiero Volpe, University of Genova, Italy; **Co-Author:** Erica Volta, University of Genova (Italy), Italy; **Co-Author:** Monica Gori, Italian Institute of Technology, Italy

This presentation addresses novel approaches to technology-enhanced learning grounded on multisensory interaction and embodiment. We argue that the intersection between current challenges in pedagogical practices and recent scientific evidence opens novel opportunities for technologies to bring a significant benefit to the learning process. In our view, multisensory technologies are ideal for effectively supporting an embodied and enactive pedagogical approach exploiting the best-suited sensory modality to teach a concept. This represents a great opportunity for making technologies, which are both grounded on a robust scientific evidence and tailored to the actual needs of teachers and students. We discuss these issues by taking, as a concrete example, the research activities carried out in the framework of the EU-H2020-ICT project weDRAW, aiming at developing multisensory technologies for supporting primary school children in learning basic mathematical concepts.

The Influence of Haptic Exploration of Objects on Knowledge Acquisition, Emotion, and Motivation

Presenting Author: Magdalena Novak, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Stephan Schwan, Leibniz-Institut für Wissensmedien, Germany

While current theories on learning in multimedia learning environments concentrate on visual and auditory access, this study focuses on a different sensory channel to acquire knowledge about a particular topic: Haptics and haptic exploration of physical objects. We have examined how this haptic experience - in combination with visual impressions - influences learning and the learning experience in informal learning environments such as museums and exhibitions. Therefore, we have created an experimental exhibition in which the sensory access to the exhibits has been systematically varied: While one group of participants could touch and see the objects, other participants could only see or touch the objects. The last group of participants could neither see nor touch the objects. The participants were asked to discover the exhibition at their own pace and depending on their interest. Participants of all experimental conditions received the same information either via audio guide or posters. We found an effect of the haptic experience on various cognitive and motivational-affective variables.

Session J 7

14 August 2019 10:15 - 11:45

Lecture Hall - H09

Symposium

Teaching and Teacher Education

A situated perspective on teachers' math professional knowledge: assessment, development, and impact

Keywords: In-service teacher education, Mathematics, Pre-service teacher education, Teacher Effectiveness, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Fien Depaepe, KU LEUVEN, Belgium

Discussant: Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands

Educational researchers generally agree that teachers' professional knowledge is at the heart of their expertise. However, the conceptualization and operationalization of mathematical professional knowledge in previous studies has been questioned. Typically, scholars take a *cognitive perspective* conceiving knowledge as mainly formal, decontextualized and fragmented, measured through classical short-answer or multiple choice paper-and-pencil knowledge tests. Studies have revealed that the relation between this decontextualized professional knowledge and instructional practice is not straightforward. Therefore, there is an interest in assessing mathematical professional knowledge in close relation to the context in which it is applied, i.e., from a *contextualized* perspective. This symposium brings together four contributions that assess teachers' *contextualized professional knowledge*. The contribution of Bruns et al. validates a scenario-based paper-and-pencil test for German pre- and in-service kindergarten teachers' mathematical professional knowledge. Teachers' performances on this test are related to their performances on a cognitively inspired professional knowledge test. Torbeyns et al. modified Bruns et al. instrument to the Flemish context. Their study validates this instrument and investigates how pre-service teachers' knowledge develops throughout kindergarten teacher education. Brunner and Lampert investigate the impact of an in-service professional development program on kindergarten teachers' contextualized professional knowledge regarding mathematical reasoning. Moreover, they investigate the impact of this knowledge on teachers' lesson planning and instructional quality. Finally, Ross et al. report on the impact of teachers' professional knowledge as assessed through cognitive tests and video-based assessments of teachers' perception, interpretation and decision-making skills on students' learning outcomes with instructional quality as a mediator variable.

Mathematical pedagogical content knowledge of kindergarten teachers – How to measure it?

Presenting Author: Julia Bruns, University of Paderborn, Germany; **Presenting Author:** Hedwig Gasteiger, Osnabrück University, Germany; **Co-Author:** Christiane Benz, Pädagogische Hochschule Karlsruhe, Germany; **Co-Author:** Esther Brunner, Pädagogische Hochschule Thurgau, Switzerland; **Co-Author:** Priska Sprenger, Pädagogische Hochschule Karlsruhe, Germany

Currently, two perspectives on mathematical pedagogical content knowledge (MPCK) are discussed: a cognitive perspective, focusing on formal knowledge and a situated perspective, focusing on contextualized knowledge. Especially for the early childhood context, where measurement instruments have to consider the special characteristics of teaching in kindergarten, we propose to combine these perspectives to a new *situation-related cognitive perspective*. This perspective focuses on knowledge (cognitive), but on knowledge that can be activated by reflecting on a concrete situation (situation-related). As a first proposal to approach this perspective, we developed a paper-and-pencil test with multiple-choice items measuring MPCK from a situation-related cognitive perspective. The test is based on four descriptions of typical kindergarten situations. Linked to each of these situations we developed a set of items measuring professional knowledge of children's abilities. Additionally, two multiple-choice items to each situation assess professional knowledge of adaptive mathematical learning activities. The 39 items were piloted with a sample of $N=55$ preservice kindergarten teachers and $N=86$ kindergarten teachers. The results show that 27 items fit to the Rasch-model, the test shows an acceptable reliability, and the construct is moderately related to measurement of kindergarten teachers' MPCK from a cognitive perspective. Therefore, the test seems to be a suitable first approach to measure MPCK from a situation-related cognitive perspective.

Characterizing preservice kindergarten teachers' math PCK using a scenario-based questionnaire

Presenting Author: Joke Torbeyns, KU Leuven, Belgium; **Co-Author:** Sandy Verbruggen, KU Leuven, Belgium; **Co-Author:** Fien Depaepe, KU Leuven, Belgium

There currently exists increasing research interest in the characteristics and development of kindergarten teachers' pedagogical content knowledge (PCK) in the domain of mathematics. However, researchers do not agree on the suitability of cognitively-oriented versus situation-related instruments to analyze this type of knowledge. Departing from Gasteiger and colleagues' (2018) recent scenario-based questionnaire that integrates both perspectives, we investigated (1) the reliability and validity of this new instrument in the Flemish kindergarten context, and (2) the development of preservice kindergarten teachers' mathematical PCK during teacher training. The scenario-based questionnaire was offered to 202 first-to-final-year preservice kindergarten teachers and 7 experts in the domain of kindergarten mathematics. Our results first demonstrate the reliability and validity of the scenario-based questionnaire in the Flemish kindergarten context. Second, first-year students had lower PCK than second- and final-year students. We discuss these findings in view of their theoretical and methodological relevance, as they point to the suitability of the instrument for large-scale studies on kindergarten teachers' contextualized PCK. Moreover, the differences between the first-to-final-year students' PCK are interpreted in terms of differential opportunities to learn, with special attention for their educational implications.

Fostering teachers' competencies for math reasoning in early mathematics education

Presenting Author: Esther Brunner, Pädagogische Hochschule Thurgau, Switzerland; **Co-Author:** Jonas Lampart, Pädagogische Hochschule Thurgau, Switzerland

In this pilot study a specific further education training was evaluated over one school year. The further education concerned specific pedagogical content knowledge (PCK) regarding mathematical reasoning in kindergarten. The aim of the study was to develop, prove and evaluate learning environments with nine kindergarten teachers during one school year. The impact of a *professional development program* was analyzed on the base of several data sources. The teachers' professional competencies concerning fostering of mathematical reasoning were measured not only by a questionnaire but also by lesson planning and videotaped reasoning sequences. The first results give a positive picture. The teachers' self-reported competencies improved over the school year. This could be confirmed by an analysis of the lesson planning and the videotaped sequences. It was possible for the kindergarten teachers to realize substantial mathematical reasoning sequences in an age-specific manner and with respect to specific principles of early education.

Classification of mathematical tasks to study subject-specific aspects of instructional quality

Presenting Author: Natalie Ross, University of Hamburg, Germany; **Co-Author:** Gabriele Kaiser, University of Hamburg, Germany; **Co-Author:** Johannes König, University of Cologne, Germany; **Co-Author:** Sigrid Blömeke, University of Oslo, Norway

The study TEDS-Validate examines the relations between the professional competence of mathematics teachers and the learning progress of the students they teach, using the measured instructional quality as a mediator variable. It is based on established instruments from previous studies. Since mathematical tasks represent a particularly important structuring tool for teaching, rational task analysis is used as an additional instrument for measuring instructional quality. Task analysis also permits to determine conceptual equivalence of various used students' performance tests. Departing from the approach of the COACTIV-study, a classification scheme for the study of cognitive aspects of mathematical tasks has been further developed. Categories are detailed by combining a theory-driven approach with the analysis of mathematical tasks from different sources. The selected comprehensive procedure ensures content validity. The a priori measures of the interrater reliability show satisfactory or better values. This approach and first findings concerning the relation of the professional competence of teachers and instructional quality in observed lessons of a subsample of these teachers will be presented and discussed in detail.

Session J 8

14 August 2019 10:15 - 11:45

Lecture Hall - H05

Symposium

Motivational, Social and Affective Processes

Error friendly learning contexts: making it safer to make mistakes

Keywords: Attitudes and beliefs, Emotion and affect, Mixed-method research, Motivation and emotion, Social aspects of learning and teaching, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Elizabeth R Peterson, University of Auckland, New Zealand

Chairperson: Maria Tulis, University of Salzburg, Austria

Organiser: Elizabeth R Peterson, University of Auckland, New Zealand

Organiser: Maria Tulis, University of Salzburg, Austria

Organiser: Gabriele Steuer, University of Bielefeld, Germany

Discussant: Dragan Trninic, ETH Zurich, Switzerland

Errors, making mistakes and overcoming failure are integral components of individual learning processes. However, productive learning from academic errors does not seem to occur spontaneously. Rather it has to be supported by a learning environment in which being wrong is not only tolerated but encouraged. The purpose of this symposium is to present research on error-related learning opportunities in different formal and informal learning settings and within primary, secondary, and higher education. More specifically, the four papers represent recent efforts to try and capture the nature and generalizability of error-friendly learning contexts in order for learners to benefit from them. Maltese et al. explore how we can increase failure friendliness among youth and educators drawing on their findings in the field of making and tinkering activities. MacKay et al. explore how a structured play exercise can be used to give undergraduate students experience with failure without compromising resilience. Steuer and Tulis investigate their model of error climate and its transferability to different subjects in the middle school. Finally, Matteucci and Soncini examine and validate sub-dimensions of error climate (e.g., error tolerance and support by the teacher) in primary and secondary schools. Overall, these papers explore the different contextual characteristics of error-friendly learning contexts and provide insights into some of the different ways we can try to promote learning from errors. Time will be allocated at the end of the symposium for a facilitated discussion on creating error friendly learning contexts.

How to increase the “failure friendliness” of maker activities

Presenting Author: Adam Maltese, Indiana University, United States; **Co-Author:** Amber Simpson, SUNY Binghamton, United States; **Co-Author:** Alice Anderson, Minneapolis Institute of Art, United States; **Co-Author:** Euisuk Sung, Indiana University, United States

It is emerging from research that failure plays an important role in designing and making, where it can increase learning, persistence and other non-cognitive skills such as self-efficacy and independence. This project aims to explore how failure during making and tinkering activities can be a critical step in the process toward deeper learning and engagement with STEM, as well as an acceptance of failure as enhancing the making and tinkering experience by both youths and educators. For this presentation, we will synthesize our findings from a variety of data sources, including videos, interviews and survey responses. Our sample includes more than 500 youths from urban, suburban and rural settings, including students from Title I schools or who qualify for free/reduced-price lunches, those from racial and ethnic minority groups, as well as students who are learning English as a second language.

Our data from over 150 educators indicate that many have an undefined view of how they should incorporate or support the idea of failure in their teaching. This led to them avoiding the topic and at times even designing experiences to prevent students from experiencing failure. Through conversation and sharing of strategies that others suggested, we found that maker educators approached planning and implementing new programs with more clarity when and where students had agency to experiment and struggle. Also, our analyses suggest that failure within making is a valuable context to explore negotiations of power and status, as failure typically evokes negative connotations and negative emotional states among youth.

Preparing students for high consequence failures, safely: A case study with zombies

Presenting Author: Jill MacKay, University of Edinburgh, United Kingdom; **Co-Author:** Alex Corbishley, The Roslin Institute, United Kingdom; **Co-Author:** Hamish Macleod, University of Edinburgh, United Kingdom; **Co-Author:** Katie Stein, The University of Edinburgh, United Kingdom; **Co-Author:** Jessie Paterson, University of Edinburgh, United Kingdom; **Co-Author:** Susan Rhind, University of Edinburgh, United Kingdom

The UK veterinary degree attracts highly motivated students who often express beliefs that academic ability is ‘fixed’, and are greatly discouraged by failure. By contrast, the veterinary profession requires resilient individuals able to cope with setbacks and learn effectively from mistakes. The role of the curriculum in producing resilient students able to practice veterinary medicine safely, in terms of their practice and the practitioner’s mental health, is currently of interest to educators. We developed a teaching exercise designed to allow 100 veterinary undergraduate students to explore ‘failure’, incorporating aspects of playful learning to encourage students to voluntarily cross boundaries, e.g. to behave unethically, selfishly and to explore the ramifications of these actions. Students were led through a role-playing scenario with player-specific tasks to complete. They were informed that the scenario was designed to ‘defeat’ them, and they were to ‘win’ by any means necessary, however the game was rigged so a ‘win’ condition was impossible. To encourage playfulness, the scenario was written as a zombie apocalypse; a debrief included videos of practicing vets discussing their own failures. Findings from the pilot indicated that the difficulty balance of the scenario required tweaking: making the scenario too simple did not evoke enough feelings of failure; but making it too complex confused students. We discuss the variation in the students’ responses to this failure scenario and will also report on our current study using our scenario to further explore how playfulness within a failure environment affects student perceptions of failure and their resilience.

Assessing the error climate in three different school subjects

Presenting Author: Gabriele Steuer, University of Bielefeld, Germany; **Co-Author:** Maria Tulis, University of Salzburg, Austria; **Co-Author:** Markus Dresel, University of Augsburg, Germany

A positive and adaptive error climate is one in which perception, evaluation and use of errors are viewed as important elements within the classroom learning process (Oser & Spychiger, 2005). While an error climate model has been proposed based on research within mathematics classrooms (Steuer, Rosentritt-Brunn, & Dresel, 2013), the transferability of the model to other subjects is missing. In this contribution, we analyzed whether the error climate proposed by Steuer et al. (2013) has a similar structure in different subjects, whether the error climate differs in different subjects and whether the same interrelationships between the ways individuals deal with errors can be found in the different subjects. In a study with 937 students we replicated the factor structure of the error climate in three different subjects. Small mean differences between mathematics and the two language subjects were found. However, the same pattern of interrelations between error climate and individual dealing with errors for all three subjects was found. This suggests that the measuring instrument for assessing the error climate may be used for different subjects which extends the usability of the measure for research.

Translation, adaptation and validation of the perceived error climate questionnaire into Italian.

Presenting Author: Maria Cristina Matteucci, University of Bologna, Italy; **Co-Author:** Annalisa Soncini, University of Bologna, Italy

In order to develop an effective learning environment a positive classroom climate needs to be established (Shapiro, 2010). One important aspect of that environment is the error-related climate. The perceived error climate has been recently investigated by Steuer, Rosentritt-Brunn, and Dresel (2013) who proposed a model which has eight sub-dimensions and one superordinate uniform factor. The present study is aimed at translating and testing the perceived error climate questionnaire in mathematics classrooms in Italian primary and secondary schools. Two studies were carried out using two different versions of the same questionnaire. In the first study, a short version (16 items) of the questionnaire was administered to primary school pupils (N=310). The results showed good internal reliability of the uniform factor ($\alpha = .77$) and good concurrent validity with the Adaptive individual reactions to errors scale (Dresel et al., 2013). However, a different factorial structure, with five sub-dimensions rather than 8 was found. In our second study, the questionnaire (31 items) was administered to secondary school students (N=290). Exploratory factor analysis showed the same original eight hypothesised factors and good reliability for each sub-dimension (Chronbach’s alpha between .65-.90). Although further analyses are needed to fully explore the reliability and validity of the short and original version of the ECQ as a measure of the perceived error climate, our findings suggest that the proposed eight-factor model appears to be promising and may be useful for those looking to assess the error climate in their classrooms.

Session J 9

14 August 2019 10:15 - 11:45

Lecture Hall - H10

Physical activity and learning experiences

Keywords: Achievement, Assessment methods and tools, Biology, Experimental studies, Literacy, Motivation and emotion, Numeracy, Primary education, Quantitative methods, Self-regulation, Special education, Student learning, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs

Chairperson: Lars-Erik Malmberg, University of Oxford, United Kingdom

Discussant: Claudia Roebbers, University of Bern, Switzerland

Physical activity is positively related to academic performance, executive functioning, mental health and self-concept. The links between physical activity and learning are theorized to be due to enhanced activation of brain areas which are used during both physical activity (PA) and cognitive tasks. In our symposium we present findings from four studies in which links between physical activity and learning are investigated. In the first study de Bruijn et al found positive effects of a higher dose of PA during a 14 week cognitively engaging moderate-to-vigorous physical activity intervention on mathematics outcomes, and lower achievers in reading performed better at posttest reading after following the cognitively-engaging intervention, whereas lower spellers had lower posttest spelling performance after the cognitively-engaging intervention. In the second study Dapp and Roebbers found that mathematical self-concept fully mediated the relationship between physical activity and mathematical achievement. In the third study, Heemskerk et al., investigated effects of physical education intensity and complexity. Preliminary results show the hypothesised inverted-U effect of intensity at low complexity. At high complexity, only low and high intensity activity showed a significant effect on subsequent on-task behaviour. In the fourth study Coe et al investigated the effect of interrupting prolonged sitting with brief standing PA interventions in young people with cerebral palsy on cognitive performance, mobility, health and wellbeing, and whether changes in insulin sensitivity and glucose metabolism mediate the effects. Overall the findings contribute to the growing body of literature on beneficial effects of physical activity on learning.

A cluster RCT examining effects of aerobic and cognitive physical activity on academic performance

Presenting Author: Anne de Bruijn, University of Groningen, Netherlands; **Co-Author:** Danny Kostons, University of Groningen, Netherlands; **Co-Author:** Irene van der Fels, University Medical Centre Groningen, University of Groningen, Netherlands; **Co-Author:** Jaap Oosterlaan, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Chris Visscher, University Medical Centre Groningen, University of Groningen, Netherlands; **Co-Author:** Esther Hartman, University Medical Center Groningen / University of Groningen, Netherlands; **Co-Author:** Roel J. Bosker, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands

Physical activity seems to positively affect primary school students' academic performance. This study examines which type of physical activity, aerobic or cognitively-engaging, has the strongest effects on academic achievement, and whether dose of moderate-to-vigorous physical activity, and baseline academic achievement influence these effects. A third and fourth grade class of 22 primary schools ($n = 891$, mean age = 9.17 years) were randomly assigned to the intervention or control group in a cluster randomized controlled trial. Intervention groups were randomly assigned to a 14-week aerobic or cognitively-engaging physical activity intervention, receiving four lessons a week. Control groups followed their regular physical education classes, two times a week. Before and after the intervention, achievement in reading, mathematics, and spelling was measured with standardized achievement tests. Dose of moderate-to-vigorous physical activity was calculated by multiplying the number of lessons followed and minutes in moderate-to-vigorous physical activity (measured with accelerometers, averaged over two lessons). Intervention effects were analyzed using multilevel structural equation models in Mplus. Posttest academic achievement did not significantly differ between the groups. A higher dose of moderate-to-vigorous physical activity resulted in better posttest mathematics achievement in the intervention groups. Compared to the control group, lower achievers in reading performed better at posttest reading after following the cognitively-engaging intervention, whereas lower spellers had lower posttest spelling performance after the cognitively-engaging intervention. Spending more time on physical education did not negatively affect students' academic performance. The amount of moderate-to-vigorous physical activity seems to be more important than the type of activities.

The mediating role of self-concept between physical activity and mathematical achievement

Presenting Author: Laura Claude Dapp, University of Bern, Switzerland; **Co-Author:** Claudia Roebbers, University of Bern, Switzerland

Being physically active has many benefits for children and adolescents. It is essential for various aspects of physical and mental health, and also positively influences academic performance and school achievement. To address the weak understanding of the link between physical activity and academic achievement, the present study investigated the effect of physical activity on mathematical achievement in fourth graders by controlling for the mathematical self-concept as a mediator variable. The results revealed a full mediation, indicating that physical activity improves mathematical self-concept, which in turn positively affects mathematical achievement. Thus, engaging in physical activities may have additional benefits for children and adolescents by enhancing their self-concept in a way—as seen from a developmental psychology perspective—that is favorable and encouraging for promoting their academic achievement.

The Impact of Physical Education Lesson Intensity and Complexity on Subsequent Learning Behaviour

Presenting Author: Christina Heemskerk, University of Oxford, United Kingdom; **Co-Author:** Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:** Steve Strand, University of Oxford, United Kingdom

Purpose: To investigate the impact of PE lesson intensity and coordinative demand, a 6-week intervention programme was developed. Based upon results from previous studies it was hypothesised that activity intensity has an inverted-U relationship with learning behaviour, and that coordinative demand has a positive relationship. Moreover, an interaction effect of intensity and coordinative demand is expected, whereby high coordinative demand negates the inverted-U relationship at high intensity. In contrast to laboratory-based studies, this study investigates PA and learning behaviour in a naturalistic setting. Moreover, it focuses on learning behaviour rather than achievement. **Methods:** A 3 (intensity) x 2 (coordinative demand) interpersonal design was used to assess the effect of PA intensity and coordinative demand on on-task behaviour. 104 children ($N_{boys} = 41$, $N_{girls} = 64$) in years 3-5 of primary school ($M_{age} = 94.78m$, $SD = 7.44m$), across 8 classrooms in 4 schools, were observed for 25 minutes in classroom lessons before and after PE lessons. Behaviour was rated on-task, passive off-task, or active off-task every 30sec. Participants completed questionnaires three times per lesson, and once at the end of the PE lesson ($N_{quest} = 3849$). Using tablets with a specifically designed app, participants rated their task enjoyment, tiredness, and emotions on a 5-point Likert scale. **Results:** Preliminary results show the hypothesised inverted-U effect of intensity at low complexity. At high complexity, only low and high intensity activity showed a significant effect on subsequent on-task behaviour.

Physical activity of Young People with Cerebral Palsy

Presenting Author: Shelly Coe, Oxford Brookes University, United Kingdom; **Co-Author:** J Collett, Oxford Brookes University, United Kingdom; **Co-Author:** Y Ng, Oxford Brookes University, United Kingdom; **Co-Author:** Foeini Mavrommati, Oxford Brookes University, United Kingdom; **Co-Author:** Patrick Esser, Oxford Brookes University, United Kingdom; **Co-Author:** Tim Theologis, Nuffield Orthopaedic Centre, United Kingdom; **Co-Author:** Julia Hyde, Oxford Health NHS Trust, United Kingdom; **Co-Author:** S Radley, Oxford Brookes University, United Kingdom; **Co-Author:** R Habteraifi, Oxford Brookes University, United Kingdom; **Co-Author:** W Wade, Ace Centre, Manchester, United Kingdom; **Co-Author:** D Pindus, Northeastern University, United Kingdom; **Co-Author:** Helen Dawes, Oxford Brookes University, United Kingdom

Young people who are more active and less inactive tend to have better health and perform stronger academically. These effects last into adulthood affecting life chances. Allowing Young People with Cerebral Palsy (YPwCP) to engage in brief structured physical activity breaks in schools, could potentially enhance their physical, cognitive, academic, social and economic performance, and legislative framework. The aim of our study was to measure the effect of interrupting prolonged sitting with brief standing physical activity (PA) interventions in YPwCP. We posed two research questions: (1) To assess the extent of immediate and longer-term effects of interrupting sitting with brief PA breaks of moderate/vigorous physical activity (MVPA) on cognitive performance, mobility, health and wellbeing. (2) To assess if changes in insulin sensitivity and glucose metabolism mediate the effects. We used a cross over randomised exposure response

experimental study. YPwCP aged 10-18 years in Secondary and Special Schools were recruited (n = 36). We measured their Motor Function Classification System level I to IV, and as outcomes: executive functioning, glucose tolerance test (OGTT), wellbeing and process evaluation. The intervention (random order) 1) Interrupted sitting using four minute, brief interventions for moderate to vigorous activity (MVPA) 2) Interrupted sitting using the 20 minute MVPA single intervention 3) Uninterrupted sitting. Outcome: we will present data on the cognitive performance and underpinning mechanisms from the interventions.

Session J 10

14 August 2019 10:15 - 11:45

Lecture Hall - H11

Symposium

Learning and Instructional Technology

Emotional-motivational factors of STEM learning games

Keywords: Educational technology, Emotion and affect, Game-based learning, Instructional design, Mathematics, Motivation and emotion, Multimedia learning, Primary education, Secondary education, Teaching/Instruction

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Steve Nebel, Chemnitz University of Technology, Germany

Organiser: Cyril Brom, Czech Republic

Organiser: Michael Kickmeier-Rust, University of Teacher Education, Switzerland

Discussant: Alexander Renkl, University of Freiburg, Germany

Substantial hype accompanies digital game-based learning (DGBL), especially in relation to games' alleged powers to target motivational and emotional factors of learning experiences. However, how to (and not to) design DGBL experiences to target these factors is largely unknown. This symposium brings together four papers examining various facets of game-related emotional and motivational factors in the context of STEM learning. The first study investigates whether a mathematical game can trigger a higher emotional arousal compared to the same intervention lacking the game element. This is one of the first studies that have done so following a clear value-added research design and using both self-reports and biofeedback measures. The second paper examines whether decorative animations in a science game can enhance learning through increasing enjoyment and free-choice motivation. This is the first study of this kind conducted with children. The third paper investigates whether motivation to interact with a math game can be increased through feedback prompting students to adopt mastery rather than performance goals. Again, this question has not been examined yet in a school setting in the DGBL context. Finally, the fourth, theoretical, paper reminds us that in schools, games and playful learning activities should be purposefully used by teachers to leverage emotional and motivational factors. To this end, a special set of teacher competences must be fostered. Altogether, the symposium addresses the important issue, that of how to leverage emotional-motivational factors in DGBL to enhance learning. A discussion will contextualize this issue within the general multimedia learning field.

Emotional arousal in game-based learning

Presenting Author:Manuel Ninaus, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Simon Greipl, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Kristian Kili, Tampere University, Finland; **Co-Author:**Antero Lindstedt, Tampere University of Technology, Finland; **Co-Author:**Elise Klein, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Hans-Otto Karnath, University of Tübingen, Germany; **Co-Author:**Korbinian Moeller, Leibniz-Institut für Wissensmedien, Germany

Under the assumption that emotion and cognition is highly interdependent, the current study examined emotional arousal during the interaction with a game-based fraction number line estimation task. We investigated emotional arousal of adult participants either interacting with a game-based task or with its non-game-based equivalent, using both conventional paper pencil instruments as well as automatic facial emotion detection from live video recordings. The game-based task was a digital learning task that made use of appealing visual design, narrative elements, and virtual incentives. The non-game-based equivalent was a purified variant in all of the previously mentioned aspects. Facial emotions were assessed frame by frame for basic emotions. Using the most prevalently detected emotions (i.e. happiness, sadness, anger, surprise), we were able to predict whether a person played the game-based number line estimation task or was dealing with its non-game based equivalent with an accuracy significantly above chance level. Furthermore, results of the PANAS affect scales indicated significantly increased aspects of positive as well as negative emotions in favour of the game-based condition. In line with the increased emotional arousal, participants felt more absorbed while playing the game-based number line estimation task and perceived the actual game to be more stimulating, more attractive, and more novel compared to its non-game-based equivalent. Taken together, this study demonstrates that a game-based learning task leads to increased emotional arousal of learners.

Decorative animations in a learning game for grade 3-4 children: An eye-tracker study

Presenting Author:Ondřej Javora, Charles University, Czech Republic; **Co-Author:**Tereza Hannemann, Charles University, Czech Republic; **Co-Author:**Tereza Starkova, Charles University, Czech Republic; **Co-Author:**Filip Déchtěrenko, Czech Academy of Sciences, Czech Republic; **Co-Author:**Cyril Brom, Charles University, Czech Republic

This study investigates the effects of decorative animations in a digital learning game for children on the animations' perceived attractiveness, learning enjoyment, attention allocation, and learning outcomes. Children (N = 134; Grades 3 - 4) played one of two versions of the game for about 20 minutes (random assignment). The first version contained little-to-no decorative animation. Certain visual elements from this version were embellished with decorative animations in the second version. The elements served an instructional purpose (they were not seductive details), but the animation itself did not have an instructional purpose. The detailed decorative animation was strongly preferred by children after they were shown both versions of the graphics ($d = 1.33$), but not before ($d = -0.15$). No between-group differences were detected in comprehension ($d = -0.21$), transfer ($d = -0.14$), and attention allocation, as measured by the eye tracker ($d = -0.18 - 0.27$). The findings are explained in terms of the cognitive-affective theory of learning with media and cognitive load theory. The findings suggest that it is worth developing detailed decorative animations in learning materials, if the materials "compete" with other entertainment multimedia content (e.g., when children browse a webpage with children's content in leisure time) for children's attention. In controlled settings, where children cannot choose materials with which to interact (e.g., school), the decorative graphics embellishments may be less needed.

Play to grow: About feedback and persistence in game-based learning for mathematics

Presenting Author:Judith ter Vrugte, University of Twente, Netherlands; **Co-Author:**Anita Luttkikhoid, University of Twente, Netherlands

Students' mindset guides their affect towards failure and learning and thus affects their motivation; prior research has demonstrated that students who adopt a growth mindset, demonstrate more persistence and experience less negative effects of challenge or failure. In this exploratory study it is investigated whether communicating growth mindset ideas in a game affects students' performance and persistence in GBL. Students received an instruction that emphasized the idea that it is practice that creates growth and that mistakes create meaningful learning opportunities. After that, students played a mathematics game in which these messages were communicated through the narrative, graphics, and feedback. The actions of these students (n = 80) were compared to the actions of students that received a similar instruction, but played a mathematics game where these messages were not embedded (n = 77). The conditions were compared on in-game measurements that serve as indicators of student motivation. Hence, measures of students' performance and persistence were compared while controlling for students level of computational fluency. Results do not favor one condition over the other (e.g., considering students' time-on-task, number of challenges played, number of challenges solved, and persistence). Among others, a possible explanation might be that the messages were not processed as intended due to the prior mindset of the students or the modality of the messages. Future studies might explore other modalities (e.g., adaptive, auditory) of conveying these messages and their effectiveness, and explore other effects of these messages (e.g., changes in students' mindset or learning outcomes).

Game-based and playful learning pedagogy in basic education

Presenting Author:Marjaana Kangas, University of Lapland, Finland; **Co-Author:**Heli Ruokamo, University of Lapland, Finland

The objectives of this theoretical study were to consider the use of game-based and playful learning in curriculum-based education and introduce a pedagogical

model developed for teachers to use and implement game and play-based activities in education. In particular, emphasis was placed on media-educational aspects and emotional-motivational factors in designing and applying game-based and playful learning. This study is based on socio-culturally oriented learning theories to provide an appropriate framework in which to consider the use of games and playful activities in teaching. The pedagogical model for game-based and playful learning is a holistic approach to the application of playful learning and games in a variety of teaching and learning contexts. The model comprises various game-based and playful learning phases, i.e., orientation, co-creation, co-play and elaboration.

Session J 11

14 August 2019 10:15 - 11:45

Seminar Room - S13

Poster Presentation

Higher Education, Teaching and Teacher Education

Higher Education

Keywords: Assessment methods and tools, Attitudes and beliefs, Competencies, Educational Psychology, Higher education, Instructional design, Mixed-method research, Motivation and emotion, Quantitative methods, Self-efficacy, Student learning, Synergies between learning teaching and research, Teacher professional development, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education

Chairperson: Tarja-Riitta Hurme, University of Turku, Finland

University lecturers' emotions: experience and display of enjoyment, anxiety and anger in class.

Keywords: Higher education, Motivation and emotion, Quantitative methods, Teaching/instruction

Presenting Author: Katharina Thies, Ostwestfalen-Lippe University of Applied Sciences, Germany; **Co-Author:** Robert Kordts-Freudinger, University of St. Gallen, Switzerland

Previous research revealed that university lecturers experience a variety of emotions in teaching (e.g. Kordts-Freudinger, 2017; Postareff & Lindblom-Ylänne, 2011) and that they use particularly response-oriented strategies of emotion regulation (e.g. Hagenauer & Volet, 2014). Applying an Experience-Sampling approach, the present study investigated university lecturers' current experiences and expressions of enjoyment, anger and anxiety while teaching. $N=114$ German university lecturers were asked to complete questionnaires about their actual experiences and expressions (suppression, increase) of enjoyment, anger, and anxiety in at least eight classes. They were also asked if they simulate these emotions in the case they did not actually experience them. In addition, the participants were invited to fill in a questionnaire about their general experiences of enjoyment, anger and anxiety (Teacher Emotion Scales, Frenzel et al., 2016) and their use of emotion regulation strategies (Emotion Regulation Inventory, König, 2011). After data collection in October 2018, the data analysis will be multilevel: the current experiences and expressions of enjoyment, anger and anxiety will be introduced on the within-level (i.e., the class level), the general emotion experiences and emotion regulation on the between-level (i.e., the university lecturer level). The detailed study findings and their implications for university education will be presented at the EARLI conference.

Professional Fragmentation of Novice Academic Identity in the Current HE Conditions

Keywords: Higher education, Mixed-method research, Synergies between learning teaching and research, Teacher professional development

Presenting Author: Jiří Kropáč, Palacký University - Faculty of Education, Czech Republic; **Presenting Author:** Stefan Chudy, Palacky University, Czech Republic; **Co-Author:** Iva Koribská, Palacký University, Faculty of Education, Czech Republic

The expectation from the side of the novice academic is based on competences, cognitive skills, knowledge and theoretical skills, practical skills and various specific hidden predisposition. (see Gavora, 2013). The novice academic has to face different pressure from the research and scientific field where is the main competence constructed on pragmatic and time-oriented base (see Miers, 2002). The aim of this article is to define the fragmented parts of the identities and their construct of the novice academics. Teaching identity is reflected the main identity, which reflects other partial identic constructs usually in the earlier phases of the carrier at the universities. Various identities of the novice academics have been analysed in the semi-large study where the sample consisted of 70 respondents from the university area, selected on the criterion by novice academic conditions. The mixed design has been used for the purposes of the research with a deep impact on the postproduction (see Mertens, 2014; Tashakkori & Teddlie, 1998). Data have been by various methods which continuously followed. (e.g. academics teaching diaries, observation and mentoring dialogue). The fragmented factors have been deeply investigated by axiological interviews (see Neuman, 2000; Kemmis & Wilkinson, 1998). Thus, the results have been processed by grounded theory with an impact on the new theories construction. The results bring new methodical tool how to deal with challenges and influence (improve) curriculum and smoother integration of the novice academics in the HE environment.

Teaching Analysis Poll in higher education: From course feedback to multi-level quality development.

Keywords: Higher education, Mixed-method research, Synergies between learning teaching and research, Teacher professional development

Presenting Author: Luci Gommers, University of St. Gallen, Switzerland; **Co-Author:** Bernadette Dilger, University of St. Gallen, Switzerland; **Co-Author:** Robert Kordts-Freudinger, University of St. Gallen, Switzerland; **Co-Author:** Christian Schneider, University of St. Gallen, Switzerland

To keep up with the changing requirements that higher education institutions have to deal with, higher education institutions invest a lot in quality development. To develop higher education sustainably, quality development processes should take place on the micro-, meso-, and macro- level and should involve stakeholders on all three levels. Beyond that, these processes should be collaborative as well as aligned with each other. Based on that, this research project evaluates the use of the feedback method "Teaching Analysis Poll" (TAP) as an instrument of quality development in HEI. TAP is a method where faculty developers, faculty and students work together to improve teaching and learning. It was implemented to improve teaching and learning processes on the course level. However, here, the data conducted with 70 TAPs will be analyzed to question if TAP has the potential to be used for higher education development on the study program and institutional level as well. First analysis indicate the existence of patterns with regard to frequencies and principles and raises issues on all three institutional levels. Also, TAP data allows a lot of insight into the perceived HEI culture, which is important to understand, especially for addressing intentional changes in the learning and teaching culture. By presenting our poster, we will contribute to different HEI's quality development questions and discuss how a method such as TAP on the micro level can contribute to development of higher education at the meso- and macro- levels.

Preparing Chilean teachers' educators for an inclusive pedagogy through a training program

Keywords: Competencies, Higher education, Teacher professional development, Teaching/instruction

Presenting Author: Constanza Herrera-Seda, Universidad de Santiago de Chile, Chile; **Co-Author:** Carolina García, Universidad de Santiago de Chile, Chile

Initial teaching training is considered to be a crucial stage to future teachers enabling them to develop the competences required to promote an inclusive education in schools. Particularly, teachers' educators are a key component to guarantee the achievement of these competences in a democratic context, and their preparation has become an important challenge in universities. The research was developed with the aim to determine the effects of a theoretical-practical training program about inclusive education on competences of Chilean teachers' educators, and it was conducted with a qualitative approach, a descriptive scope, and a phenomenological design. We collected data from 20 participants in the program who expressed their willingness to collaborate. Data was gathered through questionnaires at first, and at the end we carried out interviews and reviewed the course project elaborated for the teachers' educators. Afterward, with a basis on sensitizing concepts from literature, a deductive analysis was developed using a qualitative content technique. Three principal effects of the training program were identified. The training contributed to develop conceptions that promote an inclusive perspective in teacher education; help teachers to recognize the university context barriers which make the participation and learning difficult for all; and introduce teachers to the designing of the learning process from an inclusive pedagogy approach. Finally, we discussed the scopes and limitations of this training, the value of extending these kinds of programs in Chilean universities and the relevance of generating institutional conditions to lead to transformations in teacher education from a quality with equity perspective.

Implementing summative self-assessment to higher education

Keywords: Assessment methods and tools, Higher education, Instructional design, Student learning

Presenting Author:Henna Asikainen, University of Helsinki, Finland; **Co-Author:**Sara Lindholm, University of Helsinki, Finland

Research has shown that assessment has a great influence on how students learn. However, studies have shown that traditional teacher-led assessment still dominates in higher education practices. Promoting students summative self-assessment can be a way to foster students own responsibility of their own learning. The aim of this study was to explore the change in students' approaches to learning during a mass lecture course in which a self-assessment was implemented. Students also gave themselves the final grade. A total of 234 students (164 female) completed the course comprising 115 students who answered the questionnaire in the beginning and 128 students who answered the questionnaire in the end of the course. All data was achieved from 84 students. The results showed that surface approach decreased during the course. In addition, students whose scores on surface approach to learning decreased experienced the course most positively. Students' experiences and justifications will be analysed to the conference.

My pathway was bumpy: Senses of self and collective efficacy about higher education

Keywords: Attitudes and beliefs, Educational Psychology, Higher education, Self-efficacy

Presenting Author:Reed Curtis, Stockholm University, Sweden

In recent years there has been an increased focus on the pathways or trajectories students take through educational systems (Walther, do Amaral, Cuconato, & Dale, 2016); however, the focus has been primarily the experience prior to higher education entry. There is a need to explore how the pathways that students experienced prior to higher education impacts their decisions and entry into universities. This study does so by analyzing 11 biographical narratives of Swedish students about their pathways with particular focus on both their individual and collective family beliefs about their ability to get into and succeed in higher education.

The Swedish system perhaps is a unique case due to widespread decentralization of education in the early 1990s which led to parent and students having a direct choice of schools (Bunar, 2010). This increased the level of individual and collective or family responsibility to make an appropriate choice. The concept of self-efficacy has been utilized extensively within higher education research (Bartimote-Aufflick, Bridgeman, Walker, Sharma, & Smith, 2016; Honicke & Broadbent, 2016; Robbins et al., 2004). This study suggests that collective efficacy plays a role and has not been focused on enough in previous research. Many students in this study were impacted by their family's beliefs about whether they as a group of individuals were capable of attending and/or succeeding in higher education. This sense of collective efficacy interacts with and shapes student self-efficacy and therefore this is an aspect of educational research that needs to be investigated.

Session J 12

14 August 2019 10:15 - 11:45

Seminar Room - S03

Roundtable

Assessment and Evaluation, Higher Education

Higher Education

Keywords: Arts, Assessment methods and tools, Case studies, Cognitive skills, Comprehension of text and graphics, Content analysis, Engineering, Higher education, Qualitative methods, Reflection

Interest group: SIG 04 - Higher Education, SIG 27 - Online Measures of Learning Processes

Chairperson: Jaakko Hilppö, University of Helsinki, Finland

Integrating process data in the derivation of student test scores in evaluating online information

Keywords: Assessment methods and tools, Cognitive skills, Comprehension of text and graphics, Higher education

Presenting Author:Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Beate Eichmann, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany

Process data collected during testing with the aid of computer-based assessments are assumed to allow inferences about latent cognitive, metacognitive and motivational processes. Based on this assumption, we seek to initiate a discussion on whether and how process data should be taken into account when inferring on students' skills. The use of process data is often subject to different expectations (e.g. improvement of reliability, adaptive task selection). For the round table, we concentrate on how processing strategies can be represented with the aid of process data, and how they can be incorporated into the determination of the test score contributing to an improvement of construct representation. For guiding the discussion, we will briefly introduce the design and the properties of the EVON—an interactive performance-based test that assesses university students' skill to evaluate online information in a simulated web search context. The instrument provides a series of search tasks together with a given search query, a search engine result page and corresponding websites. It requests students to select the most useful and credible link for the respective search task. In this environment, process variables might take forms of navigation sequences or time spent on particular pages. Based on the introduction, we discuss how process data that indicate construct-relevant processes and strategies can be included in the representation of students' evaluation skill, what implications this has for the interpretation and use of test results, and how a study should be designed to challenge the interpretation of these modified test scores.

Fostering Industrial Design students' professional identity

Keywords: Arts, Content analysis, Higher education, Reflection

Presenting Author:Migchiel van Diggelen, Open University of the Netherlands, Netherlands; **Co-Author:**Sonia Gomez Puente, Eindhoven University of Technology, Netherlands; **Co-Author:**Izabela Boloz, Eindhoven University of Technology, Netherlands

Explicitly fostering students' Professional Identity Development (PID) is beneficial for students' learning but hardly an *explicitated* goal of programs and courses in Higher Education. Consequently, little knowledge is available to inform teachers on how to design courses for PID. This qualitative study was performed in the Netherlands in the context of a course designed to support Industrial Design students of the Eindhoven University of Technology their PID. Deliverables from randomly selected students with an excellent (E) grade (n=8), a sufficient (S) grade (n=8) and an insufficient (I) grade (n=8) were analysed. We looked for commonalities and differences in what these students reported in their deliverables and how they reported it. A within-case and cross-case analysis were performed using frequency of codes and rubrics. To display the data a matrix approach was applied. Findings point to 1) the relevance of having self-knowledge for writing strong reflections, and 2) the possibility of identifying students who will develop their PI excellently, sufficiently and insufficiently based on what they report relatively early in their PID and on only a few deliverables. Finally, the findings provide direction for educational practitioners and coaches to undertake a more differentiated approach in supporting students in their PID. The significance of this paper lies in studying the relevant topic of PID in a course that *explicitly* targets students PID in the unusual domain of Higher Industrial Design Education.

Performing Arts as Pedagogical Mediation in Higher Education

Keywords: Arts, Case studies, Engineering, Qualitative methods

Presenting Author:Laure Kloetzer, Institute of Psychology & Education, Switzerland; **Co-Author:**Simon Henein, EPFL-Microcity, Switzerland; **Co-Author:**Ramiro Tau, Institute of psychology and education, University of Neuchâtel, Switzerland

The *Performing Arts as Pedagogical Tool in Higher Education* (ASCOPET, in French) research project describes, analyzes, and evaluates the utilization of the performing arts in higher education. This is achieved by a comparative study of two courses:

-Collective creation: improvised arts and engineering, taught at EPFL (Switzerland);

-Psychology and migration, taught at the University of Neuchâtel (Switzerland).

Both courses involve embodied learning through stage performance as part of the curriculum. The data analyzed for the research consist in videorecordings of the courses (60 hours), 40 initial presentations of the students, 25 final interviews with the students, repeated interviews of the teachers of the two courses, and 40 learning diaries continuously written by the students to reflect on their participation to the course. It also includes ethnographic data from a close follow-up of 4 teams of 5 students in the creation process of their final group performance. The roundtable presentation will highlight the dynamics at play in these two courses, identifying similarities and differences. Three key dimensions are identified: the function of the collective dimension of the teaching-learning experience ; embodiment as a way to overcome the cognition/emotion divide; use of semiotic mediations to focus the collective creation process.

Session J 13

14 August 2019 10:15 - 11:45

Seminar Room - S01

Roundtable

Educational Policy and Systems, Learning and Social Interaction, Teaching and Teacher Education

Qualitative Methods

Keywords: Attitudes and beliefs, Bilingual education, Comprehension of text and graphics, Early childhood education, Educational policy, Language (Foreign and second), Multicultural education, Pre-service teacher education, Qualitative methods

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education

Chairperson: Kim Dirx, Open University, Netherlands

“Understanding About the Kid is Very Important”: Equity in Data Literacy for Teaching

Keywords: Attitudes and beliefs, Multicultural education, Pre-service teacher education, Qualitative methods

Presenting Author:Jori Beck, Old Dominion University, United States; **Co-Author:**Christina Santoyo, Young Harris College, United States

Teachers' knowledge of and ability to use data is a growing area of concern internationally. National assessments are being administered around the world and their use has direct implications for teachers and teacher preparation programs. However, the bulk of research on data literacy for teaching has been conducted with inservice teachers and, to date, very little research has focused on equity in data literacy for teaching at any level. The current study conveys the continuum of beliefs regarding equity in data literacy for teaching expressed by teacher candidates in one teacher education program. A constructionist grounded theory approach was used to leverage the researchers' positionality as equity-minded educators and scholars.

Book sharing with young dual language learners in preschool

Keywords: Bilingual education, Comprehension of text and graphics, Language (Foreign and second), Qualitative methods

Presenting Author:Svitlana Kucherenko, University of Oslo, Norway; **Co-Author:**Veslemøy Rydland, University of Oslo, Norway; **Co-Author:**Vibeke Grøver, University of Oslo, Norway

This study examines reciprocal relations between the cognitive levels of preschool teacher questions and young dual language learners' contributions in the context of small-group shared book reading. Participants are 153 dual language learners (age 3-5) and 54 preschool teachers in multiethnic preschool classrooms in Norway. Teacher questions and child contributions are coded for cognitive level of demand: for example, the question “What color is his nose?” is coded as concrete literal question and the question “Why didn't he want to go to the South Pole?” is coded as abstract inferential question. Sequential analysis will be conducted to show how prevalent these cognitive levels are in teacher and child talk and in which ways dual language learners align with the cognitive level of preschool teachers' questions. Additionally, sequential analysis will show whether the cognitive levels of child contributions also shape the subsequent level of teacher input.

First Job and the Unequal Distribution of Early-Childhood Educators: Evidence for the case of Chile

Keywords: Early childhood education, Educational policy, Pre-service teacher education, Qualitative methods

Presenting Author:Veronica Cabezas, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Constanza Gomez, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**María Jesus Sanchez, Pontificia Universidad Católica de Chile, Chile

First job is key to understand future teacher trajectories; this article examines the job search and selection process for beginning early childhood teachers. Thirty-one participants with less than two years of experience as early childhood teacher were interviewed. They worked in public and private settings, both in schools and early childhood centers. This article reports beginning teachers' views about the role that initial training characteristics have on the job search process, their perceptions about job characteristics, and the importance that different pecuniary and nonpecuniary factors have on the job search process. Early childhood teachers confront a different labor market from the rest of the teachers, so challenges of first job search process need to be addressed.

Session J 14

14 August 2019 10:15 - 11:45

Seminar Room - S16

Poster Presentation

Higher Education

Higher Education

Keywords: Achievement, Argumentation, Collaborative Learning, Competencies, Content analysis, E-learning/ Online learning, Educational attainment, Educational Psychology, Higher education, Interdisciplinary, Learning approaches, Phenomenography, Pre-service teacher education, Psychometrics, Quantitative methods, Secondary data analysis, Self-efficacy, Teaching approaches

Interest group: SIG 04 - Higher Education, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Ida Kukliansky, Ruppin Academic Center, Israel

Graduates' generic competences and approaches to learning in relation to thesis grade and study pace

Keywords: Competencies, Higher education, Learning approaches, Quantitative methods

Presenting Author:Tarja Tuononen, University of Helsinki, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland

University graduates are expected to develop generic competences during their studies. These competences are usually seen as learning outcomes although they can be important also in learning and study processes (Kamphorst et al. 2013; Lizzio, Wilson & Simons, 2002). The present study aims to explore graduates' evaluations of their generic competences at the time of their graduation and the relation between generic competences, approaches to learning and thesis grade and study pace. A total of 1023 Finnish graduates filled in an electronic questionnaire and their study success information were gathered from the Student Register. The data were analysed using Pearson's correlations and linear regression analysis (forward method). The results revealed that four out of seven competences were positively and statistically significantly related to thesis grade but none of the competences were related to study pace. In addition, the results showed that organised studying was related to both thesis grade and study pace. To conclude, in order to succeed in studies, it is important that students are able to develop diverse generic competences as well as organised studying during their studies.

Less Dropout in Teacher Education Programs Using Aptitude Tests for Student Selection?

Keywords: Higher education, Pre-service teacher education, Psychometrics, Secondary data analysis

Presenting Author:Sebastian Franz, Leibniz Institute for Educational Trajectories (LIfBi), Germany; **Co-Author:**Jennifer Paetsch, University of Bamberg,

Germany

In recent years, more and more aptitude tests are established as a gate keeper for teacher training programs at German universities. By aptitude tests suitable academically and professionally teacher candidates ought to be selected into teacher education programs. However, little is known about the effectiveness and prognostic validity of this admission practice. For the German context there is no clear evidence that teacher education students who passed an aptitude test are more likely to be academically and professionally successful. Using data from the German National Educational Panel Study (NEPS) we analyze whether passing an aptitude test as a teacher candidate is related to academic success. Academic success in teacher education can be defined as completing the program and receiving a degree to be able to teach in schools. Therefore leaving a teacher training program without a degree can be an indicator for being unsuccessful in teacher education. To investigate the influence of aptitude tests on leaving a teacher education program, we estimate logistic regressions and average marginal effects. First results show that passing an aptitude test does not affect the probability of dropping out of teacher education programs. However, for certain teaching subjects, we found a negative effect of aptitude tests on the decision to leave teacher education.

An intervention on critical thinking through argumentation: findings and implications

Keywords: Argumentation, Collaborative Learning, Educational Psychology, Higher education

Presenting Author:Jarmila Bubikova-Moan, Nordic Institute for Studies in Innovation, Research and Education, Norway; **Co-Author:**Leila Ferguson, Kristiania University College, Norway

Critical thinking has long been embraced as a core educational goal. However, it remains a somewhat elusive concept for many educators and students alike. Combining insights from scholarship on epistemic cognition, critical thinking and argumentation theory, we designed and implemented a small-scale pilot intervention for first year educational sciences students that aimed to foster critical thinking through explicit training in argumentation with an emphasis on teacher-led, small-group discussions, oral participation, structured summation and formative feedback. Our poster presentation focuses on the background for and structure of the critical thinking class that we taught and tentative findings from focus group interviews based on thematic and frequency analysis. Finally, on the basis of analysis of focus group interviews and our experiences with teaching the class, we also offer practical and theoretical insights that we plan to incorporate into future research on teaching critical thinking.

The Relevance of Digital Media Self-Efficacy and Media Usage for Achievement in Higher Education

Keywords: Achievement, Higher education, Quantitative methods, Self-efficacy

Presenting Author:Marina Pumprow, University of Tübingen, Germany; **Co-Author:**Taiga Brahm, University of Tübingen, Germany

Although digital media are prevalent in several areas of everyday life, their role in academic settings and their relevance for academic achievement are not satisfactorily explored. In particular, factors such as underlying motivations, emotions, self-evaluations or self-efficacy are hardly considered. The present study aims to identify relevant individual, contextual and social factors for academic performance in an integrative model and therefore allow for a deeper understanding of mechanism for disadvantages of certain student groups. Therefore, we will present first results of a conducted survey to explore the relationship of university students' study performance and their media behaviour. For this purpose, individual, contextual as well as social background factors are analysed, with a special focus on academic and digital media self-efficacy expectations. After a pre-test with three participating higher education institutions at the end of 2017 (where reliability and validity of the survey instrument was established), data was collected at four German universities from May to July 2018. In total, 1925 participants completed the online-survey. The instrument again proved to show valid and reliable results. In a next step, the data will be analysed in terms of the expected relationships of self-efficacy expectations, media behaviour and study performance. The results of these analysis will be presented at the conference.

Academic staffs experiences of inclusive teaching in online education

Keywords: E-learning/ Online learning, Higher education, Phenomenography, Teaching approaches

Presenting Author:Ida Naimi-Akbar, KTH Royal Institute of Technology, Sweden; **Co-Author:**Linda Barman, The Royal Institute of Technology (KTH), Sweden; **Co-Author:**Maria Weurlander, The Royal Institute of Technology (KTH), Sweden; **Co-Author:**Cormac Mc Grath, Stockholm University, Sweden

The digitalization of society is an ongoing process and all sectors will be influenced, higher education is no exception. This contribution reports on a phenomenographic study with the aim to explore the variations in academic staffs' experiences of inclusive teaching in designing and deliver online education. We found different categories of how academic staff understands what inclusiveness is when creating teaching material in a digital media. To make the transformation of teaching and learning in a digital media puts an amount of demands on academic staffs. Our result show that academic staff tends to have a simplified and naive view on how inclusive teaching can be address in online or blended education settings.

Outcomes of Higher Education. A Literature Review

Keywords: Content analysis, Educational attainment, Higher education, Interdisciplinary

Presenting Author:Kristina Walz, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Julia Carolin Brachem, Universität Vechta, Germany; **Co-Author:**Edith Braun, Justus-Liebig-Universität Giessen, Germany

One of main objectives of higher education (HE) is preparing students for the demands of nowadays, including social participation, adequate position at the labour market, and positive well-being. So far, we have several findings of outcomes of higher education from diverse interdisciplinary fields. The contribution brings together the wide interdisciplinary results. The aim is to combine specific national studies with wider international research and theories. Therefore, we have conducted a literature review, using the databases Eric, Google Scholar and JustFind (a local database). We started the review by collecting recent reviews and meta-analysis. We than used cross-references to find relevant literature. We identified 93 publications, including 15 books, 65 articles, 13 chapters or other contributions so far. As a first result, a categorization system was developed, which structures the findings. The system contains the following sections: (1) General overview of higher education graduates, (2) Higher education outcomes, (2.1) Qualification, skills and competences, (2.2) Individual and societal returns to education, (3) Higher education graduate destinations, (3.1) Transitions to labour market, and (3.2) Career opportunities and professional requirements. The results are international comparable and allow general statements of learning outcomes in higher education. The contribution indicates a world-wide trend of focussing on Outcomes of Higher Education, and comparability within European Higher Education Area.

Session J 15

14 August 2019 10:15 - 11:45

Seminar Room - S09

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

Early Childhood Education

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Cognitive development, Early childhood education, Educational Psychology, Experimental studies, Language (Foreign and second), Learning and developmental difficulties, Lifelong learning, Mathematics, Motivation, Peer interaction, Pre-service teacher education, Teacher professional development

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion

Chairperson: Jennifer Schwarze, RWTH Aachen University, Germany

Young children's strategy generalization of geometry reasoning: a microgenetic analysis

Keywords: Cognitive development, Early childhood education, Experimental studies, Mathematics

Presenting Author:Mei-i Chien, National Chia-yi University, Taiwan

This study investigated differences of kindergarteners' changes of strategy generalization of geometry reasoning between a concrete and an abstract-concrete representation conditions of exploration with geometric shapes. The primary goal was to analyze children's strategy generalization of geometric shape identification. The second goal was to compare children's performance of geometric reasoning between different representation conditions of geometric shapes. The third goal was to examine the detailed changes along children's learning process of geometry reasoning. These goals were pursued in the context of rectangle identification trials that could be solved by different strategies of geometric reasoning, and therefore allows direct comparison of the effects between encountering different representation interventions. A microgenetic analysis method was used as the study design. There were 56 five-year-olds participated in the experiment. Participants were randomly arranged into an experimental or a comparative group according to their performance on the pretest. Children of the experimental group explore shapes with concrete manipulatives and their identical abstract line-drawings, while the comparative group explore with concrete manipulatives only. The preliminary result was that children's strategy generalization of rectangle identification was following the developmental hierarchy of geometry reasoning levels of van Hiele's theory for both groups. Children in the abstract-concrete representation condition used higher percentage of more comprehensive strategies on the rectangle identification tasks than the concrete only representation condition. Regarding the path, rate, breath, and variability of change in geometry reasoning, children in the abstract-concrete representation condition performed better than the concrete only representation condition, too.

The processing of symbolic and non-symbolic magnitudes at the end of childhood education.

Keywords: Early childhood education, Educational Psychology, Learning and developmental difficulties, Mathematics

Presenting Author:Carlos Mera, University of Cadiz, Spain; **Co-Author:**Manuel Aguilar-Villagran, University of Cadiz, Spain; **Co-Author:**Estibaliz Aragón, University of Cadiz, Spain; **Co-Author:**Belén Román, University of Cadiz, Spain; **Co-Author:**Jose I. Navarro-Guzman, University of Cadiz, Spain

There is a debate in the scientific literature about the beginning and development of symbolic and non-symbolic magnitudes processing. It is unclear how numerical representations develop over time. Younger children are more fluent with non-symbolic quantities because a non-symbolic numbers processing occurs from early childhood. However, the meanings of numbers need to be taught and learned. The non-symbolic magnitude representations are the basis for numerical-symbols learning. Although several studies have examined changes in symbolic and non-symbolic skills in a transversal way, few have examined these processes longitudinally in students before start formal schooling. Thirty-one children of the last preschool course (aged 5) completed a symbolic and non-symbolic magnitude processing task in three moments. We found that the processing skills of the symbolic and non-symbolic magnitude had a parallel growth but different trajectories of development. The processing of the symbolic magnitude was characterized by higher improvements than the non-symbolic abilities throughout the period studied (5-to-6-yearold students). We found statistically significant differences between non symbolic and symbolic comparison on the first assessment. But these differences disappeared in the next two assessments. Results also suggest that the relationship between symbolic and non-symbolic processing is still unclear. We remark that when compulsory schooling begins, the processing of symbols begins to be "independent" of the system that allows processing the non-symbolic magnitudes (Approximate Number System, ANS).

Professionalization of dialogue in play guidance within preschool

Keywords: Early childhood education, Language (Foreign and second), Peer interaction, Teacher professional development

Presenting Author:Eline van Rossum, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Chiel vander Veen, VU University Amsterdam, Netherlands; **Co-Author:**Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Clasien de Schipper, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Maartje Rajmakers, Vrije Universiteit Amsterdam, Netherlands

Abstract. Interaction quality of preschool teachers is crucial for the development of children. Play is a central element in preschool, but how teachers should interact with children during play is not self-evident. This project investigates how preschool teachers can learn to implement dialogical conversations in play guidance. These teachers take part in two types of intervention on dialogue in play guidance: a training and a network. The research question is: *How do two types of professionalization affect the vocabulary development, wellbeing and social status of children in preschool?* 120 preschool teachers participate in this project of which 40 receive training, 40 participate in a network and 40 are in the control group. We measure passive vocabulary development, wellbeing at the preschool and social status of the children. Data are analyzed with multilevel modeling. We expect that by professionalizing the preschool teachers on dialogue, in play guidance, the vocabulary, wellbeing and social status of children will improve.

The first two years in school: the impact of inattentive, hyperactive and impulsive children

Keywords: Attitudes and beliefs, Cognitive development, Early childhood education, Lifelong learning

Presenting Author:Tiago Bartholo, Federal University of Rio de Janeiro, Brazil; **Co-Author:**Mariane Campelo Koslinski, Federal University of Rio de Janeiro, Brazil; **Co-Author:**Karina Santos, Federal University of Rio de Janeiro, Brazil

This paper describes children's cognitive development in their first two years at compulsory school, ages 4-5-6, in Rio de Janeiro public schools, using iPIPS (International Study of Children Starting School), and analyses the impact of behavior and Personal Social and Emotional Development (PSED) when children first start school (baseline) and their academic outcome. The data used in the analysis was based on two waves of data collection of a longitudinal study, Baseline Brazil (2017 and 2018). Key research questions are: 1- What children know and can do when they first start school? 2- How much progress is made in the first two years in school? 3- What is the impact of behavior scale and PSED in children's cognitive development? A representative stratified random sample of 47 Public Schools in Rio de Janeiro (2740 children in 132 classrooms) were selected to participate in the study. The teachers completed questionnaires in a sub-sample of 800 children about their behavior, including questions about attention, hyperactivity, impulsivity and PSED. Based on the DSM-IV (1994), the questionnaires reveal two scales used for the diagnosis of Attention Deficit and Hyperactivity Disorder. Hierarchical linear models were used to estimate the impact of inattentive, impulsivity/ hyperactivity and PSED. Preliminary results suggest that: a) an impact of 0.3 effect size of the inattentive scale and of 0.35 of PSED on how baseline cognitive measure; b) Impulsivity/ Hyperactivity is not associated with children's cognitive development; c) Inattentive and PSED predicts children's cognitive development during preschool (effect size of 0.25).

Motivation, academic achievement and family practices: A cross-sectional investigation in 1st grade

Keywords: Achievement, Early childhood education, Mathematics, Motivation

Presenting Author:Raquel De Sixte, University of Salamanca, Spain; **Co-Author:**Marta Ramos, Salamanca University, Spain; **Co-Author:**Álvaro Jáñez, University of Salamanca, Spain; **Co-Author:**Javier Rosales, University of Salamanca, Spain

The present study offers data on the relationship between 6 year old children's motivation (measured under a self-determination theoretical framework) and their performance on maths and reading, considering family (formal and informal practices and expectations) as main educational agents at an early age. Regarding academic achievement, results show a positive relation between intrinsic motivation and academic achievement in both domains. Also, data from families show significant correlations between formal maths practice at home and controlled regulation as well as parents' expectations in maths with children's intrinsic motivation. The interaction academic achievement x family, show negative significant correlations between informal math practice at home and math achievement at school and positive correlations between parents' expectations in reading and children's reading achievement. These results suggest that families, as educational agents, have an impact both on students' motivation towards maths and academic achievement in reading and math. Implications for education and research are discussed.

Can online tests adequately replace paper-and-pencil versions?

Keywords: Assessment methods and tools, Early childhood education, Mathematics, Pre-service teacher education

Presenting Author:Markus Szczyzny, Humboldt Universität zu Berlin, Germany

In contrast to its widespread use, there are only few studies available which examine the comparability of paper-and-pencil-tests with corresponding online adaptations. In the present study, a test of mathematical abilities of early childhood educators was used as an online and paper-and-pencil version. The data was analyzed by item response theory (IRT), including tests of differential item functioning (DIF). It could be shown that on the one hand reliable and valid data,

especially for multiple choice items, can be obtained online and that both test versions are comparable with regard to item difficulty and individual test scores. On the other hand, open and partially open response-formats showed a considerable amount of differential item functioning (DIF).

Session J 16

14 August 2019 10:15 - 11:45

Seminar Room - S02

Roundtable

Lifelong Learning, Teaching and Teacher Education

Lifelong Learning

Keywords: Competencies, Content analysis, Experimental studies, Goal orientation, Learning analytics, Lifelong learning, Mixed-method research, Pre-service teacher education, Qualitative methods, Teacher professional development, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Camilla Østerberg Rump, University of Copenhagen, Denmark

The Contribution of Mental Simulation to the Development of Intuition

Keywords: Content analysis, Lifelong learning, Qualitative methods, Workplace learning

Presenting Author: Bianca Steffen, University of Paderborn, Germany; **Co-Author:** Michael Goller, University of Bamberg, Germany; **Co-Author:** Christian Harteis, University of Paderborn, Germany

Intuition is an important quality of expertise which is developed through professionals' learning through experience. It can be defined as the knowledge base needed to recognize situational cues that allow experts to access memorized information spontaneously (Simon, 1992). An important contribution to the development of intuition comes from mental simulations. However, the relation between mental simulation and intuitive decision making is not yet explained (Harteis, 2017). Only few empirical studies concerning this particular relationship exist. Crisis response workers (CRW) have only limited time to make decisions within complex situations, it follows that intuition might be a key element for their work. CRW offer counselling and mental support to victims in emergency situations. So far, empirical research in the domain of CRW is scarce. It follows that this contribution aims at (1) understanding the importance of intuition for CRW in general and (2) explaining in particular how mental simulation contributes to the development of intuition.

The role of goal-setting in formal learning scenarios - lessons learned from an experiment

Keywords: Experimental studies, Goal orientation, Learning analytics, Lifelong learning

Presenting Author: Gábor Kismihók, Leibniz Information Centre for Science and Technology, Germany; **Co-Author:** Stefan Mol, University of Amsterdam, Netherlands; **Co-Author:** Vladimer Kobayashi, University of Amsterdam, Netherlands; **Co-Author:** Catherine Zhao, The University of Sydney, Australia

This roundtable discussion will discuss the outcomes of a goal setting experiment in a formal, academic learning environment. During the roundtable the following points will be discussed: 1, the motivation behind using goal setting theory and methodology in education; 2, the experimental design and the methodology we used in our experiment; 3, The outcomes of the study, both from a technical (goal setting app, connected to an institutional Learning Record Store) and pedagogical point of views (impact on learning success). 4, Possible reasons for the limited success of goal setting in this experiment, 5, Recommendation and possible improvements of instructions for further goal-setting experiments both in formal and informal learning scenarios

Effects of internships on self-perceived competencies and didactic skills of prospective RE teachers

Keywords: Competencies, Mixed-method research, Pre-service teacher education, Teacher professional development

Presenting Author: Carina Caruso, University of Paderborn, Germany; **Co-Author:** Christian Harteis, University of Paderborn, Germany; **Co-Author:** Jan Woppowa, University of Paderborn, Germany

A lot of research on teachers' professional development focuses on formal learning in educational institutions (Baumert & Kunter 2006). Competence-based teacher training raises questions for empirical research particularly regarding the impacts of internships and practical phases as regular parts of study programmes: At the same time, many teacher education programmes nowadays implemented long-term internships. The main purpose of these internships aims at the development of competencies and skills through practical experience. This contribution discusses findings of a mixed-methods study that investigates the development of self-perceived didactical competencies and didactical skills of catholic theology students during a long-term internship (5 months) in a German teacher education master programme. The results reveal in which didactical fields (EKD, 2009) the students improved and in which they did not during the internship. Furthermore, the results reveal that the students do not expect to be able to combine theory and practice after the internship. This contribution provides an explanation for the empirical finding that pre-post measurements do not differ significantly in all investigated issues.

Session J 17

14 August 2019 10:15 - 11:45

Seminar Room - S05

ICT Demonstration

Learning and Instructional Technology

Learning Growth Estimator

Keywords: Achievement, Assessment methods and tools, Learning analytics, Secondary education

Interest group:

Chairperson: Venance Timothy, Ludwig-Maximilians-Universität (LMU), Tanzania, United Republic of

The Learning growth estimator (LGE) is an online tool that provides educationalists with a fast and accurate measure of their teaching impact upon their students. In statistical terms, effect size calculations enable the change between two sets of data to be quantified. The LGE therefore provides more detailed insights into the effectiveness of psycho-pedagogical interventions beyond that resulting from basic comparisons, significance tests, and other statistical methods. The LGE compares school and individual results to state/territory values and allows for learning growth to be measured in a standardised manner that is independent of sample size. It produces several interactive reports that are both useful and easily accessed. Underpinned by John Hattie's principals of Visible Learning, the LGE focuses on providing valuable feedback to educationalists and enables them to quickly assess their teaching effectiveness without the prerequisite of statistical proficiency.

Learning Growth Estimator

Presenting Author: Jesus Camacho-Morles, The University of Melbourne, Australia

The Learning growth estimator (LGE) is an online tool that provides educationalists with a fast and accurate measure of their teaching impact upon their students. In statistical terms, effect size calculations enable the change between two sets of data to be quantified. The LGE therefore provides more detailed insights into the effectiveness of psycho-pedagogical interventions beyond that resulting from basic comparisons, significance tests, and other statistical methods. The LGE compares school and individual results to state/territory values and allows for learning growth to be measured in a standardised manner that is independent of sample size. It produces several interactive reports that are both useful and easily accessed. Underpinned by John Hattie's principals of Visible Learning, the LGE focuses on providing valuable feedback to educationalists and enables them to quickly assess their teaching effectiveness without the prerequisite of statistical proficiency.

Session J 18

14 August 2019 10:15 - 11:45

Seminar Room - S07

Workshop

Higher Education

Solving the employability dilemma in higher education

Keywords: Cognitive development, Developmental processes, Higher education, Metacognition

Interest group: SIG 04 - Higher Education

Chairperson: Victoria Johansson, Lund University, Sweden

AbstractGraduate employability is a shared concern for educators, students and institutional leaders. This workshop engages participants in a proven metacognitive approach to employability development. The approach embeds employability thinking within the existing higher education curriculum, enables students to shape their future work and career, and creates the datasets enable global research into students' thinking about their studies and their future lives and careers. EmployABILITY thinking is a strength-based, metacognitive approach to employability development delivered within the existing curriculum and without the need for additional time, cost, expertise or resources. The approach prompts students to understand why they think the way they think, how to critique and learn the unfamiliar, and how their values, beliefs and assumptions can inform and be informed by their learning, lives and careers. As suggested by its use of capitals, rather than focus on learners' potential to be "employed" and directed by others, the approach focusses on learners' ABILITY to create and sustain meaningful work. This is as relevant to workers in traditional, full time employment with a single employer as it is to workers who combine multiple roles to create portfolios of work. The workshop will engage participants in a personalised self-assessment profile and the resources and strategies with which to embed employABILITY within existing programs and courses. The workshops will suit teachers, program leaders, curricular designers, senior managers and careers advisors. No prior expertise or experience is required.

Solving the employability dilemma in higher education

Presenting Author:Dawn Bennett, Curtin University, Australia; **Presenting Author:**Colin Jevons, Monash Business School, Australia

AbstractGraduate employability is a shared concern for educators, students and institutional leaders. This workshop engages participants in a proven metacognitive approach to employability development. The approach embeds employability thinking within the existing higher education curriculum, enables students to shape their future work and career, and creates the datasets enable global research into students' thinking about their studies and their future lives and careers. EmployABILITY thinking is a strength-based, metacognitive approach to employability development delivered within the existing curriculum and without the need for additional time, cost, expertise or resources. The approach prompts students to understand why they think the way they think, how to critique and learn the unfamiliar, and how their values, beliefs and assumptions can inform and be informed by their learning, lives and careers. As suggested by its use of capitals, rather than focus on learners' potential to be "employed" and directed by others, the approach focusses on learners' ABILITY to create and sustain meaningful work. This is as relevant to workers in traditional, full time employment with a single employer as it is to workers who combine multiple roles to create portfolios of work. The workshop will engage participants in a personalised self-assessment profile and the resources and strategies with which to embed employABILITY within existing programs and courses. The workshops will suit teachers, program leaders, curricular designers, senior managers and careers advisors. No prior expertise or experience is required.

Session J 19

14 August 2019 10:15 - 11:45

Seminar Room - S12

ICT Demonstration

Learning and Social Interaction

Making the intangible tangible: a tool for engineering connected classroom environments.

Keywords: In-service teacher education, Interdisciplinary, Social aspects of learning and teaching, Social interaction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Kathryn Bartimote-Aufflick, The University of Sydney, Australia

The learning environment, engagement, and achievement are reciprocal: influencing each other and a range of learner outcomes. Fundamental to effective learning environments are high levels of learner engagement: a connection to *what* they are learning, *how* they are learning, and *who* they are learning with and from. This multi-dimensional experience of connection is the result of both conscious and unconscious processes. However, managing learning environments and learner engagement can be challenging for many teachers, as it involves a range of intangible and innate qualities that can be difficult to articulate. Teachers of all levels of experience are seeking practical ways to address disengagement and improve learning environments. In the past, disengagement has been met with relatively ineffective strategies aimed at individual students – approaches that overlook the natural social dynamic of the classroom. Consequently, there have been recent calls to consider wider social constructs to increase engagement. This ICT Demonstration will present an evidence-informed self-regulatory tool for teachers designed to enhance the broader, more holistic experience of connection in the classroom. Applied in both school and more recently University settings, this tool successfully synthesizes empirical findings with the science of learning to make the intangible tangible. Learning in the present, we can enhance learning environments, engagement and achievement for the future.

Making the intangible tangible: a tool for engineering connected classroom environments.

Presenting Author:Stephanie MacMahon, The University of Queensland, Australia

The learning environment, engagement, and achievement are reciprocal: influencing each other and a range of learner outcomes. Fundamental to effective learning environments are high levels of learner engagement: a connection to *what* they are learning, *how* they are learning, and *who* they are learning with and from. This multi-dimensional experience of connection is the result of both conscious and unconscious processes. However, managing learning environments and learner engagement can be challenging for many teachers, as it involves a range of intangible and innate qualities that can be difficult to articulate. Teachers of all levels of experience are seeking practical ways to address disengagement and improve learning environments. In the past, disengagement has been met with relatively ineffective strategies aimed at individual students – approaches that overlook the natural social dynamic of the classroom. Consequently, there have been recent calls to consider wider social constructs to increase engagement. This ICT Demonstration will present an evidence-informed self-regulatory tool for teachers designed to enhance the broader, more holistic experience of connection in the classroom. Applied in both school and more recently University settings, this tool successfully synthesizes empirical findings with the science of learning to make the intangible tangible. Learning in the present, we can enhance learning environments, engagement and achievement for the future.

Session J 20

14 August 2019 10:15 - 11:45

Seminar Room - S15

Poster Presentation

Culture, Morality, Religion and Education, Instructional Design, Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Secondary Education

Keywords: Comprehension of text and graphics, Cultural diversity in school, Goal orientation, Learning analytics, Mathematics, Motivation and emotion, Out-of-school learning, Quasi-experimental research, Reading comprehension, Religious studies, Secondary education, Self-regulation, Social aspects of learning and

teaching, Student learning, Survey Research, Teaching/instruction, Technology

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction, SIG 13 - Moral and Democratic Education, SIG 19 - Religions and Worldviews in Education

Chairperson: Jose Felipe Martinez, University of California, United States

Rhetorical competence and rhetorical devices in text comprehension in Secondary Education

Keywords: Comprehension of text and graphics, Reading comprehension, Secondary education, Student learning

Presenting Author: María García Serrano, University of Salamanca, Spain; **Co-Author:** J. Ricardo García Pérez, University of Salamanca, Spain; **Co-Author:** Javier Rosales, University of Salamanca, Spain

Comprehending texts is an instrumental skill that our students use every day. In Secondary Education, most of the texts they read are expository texts. Two elements that can be decisive to understand these kind of texts are the rhetorical devices, and the rhetorical competence, the ability to detect rhetorical devices. In this research we examine if the rhetorical devices understood as signs that illuminate the logical relations among ideas of the text, have influence in reading comprehension in this students using different texts. In addition we explore, if the rhetorical competence at this ages predicts and / or moderates the performance of the students when they read texts with different rhetorical devices. The results of the research show that, in the first place, the students who read the marked texts, were able to select more important ideas, beside having more organized recall of what they had read. Secondly, the rhetorical competence, predicted the performance in both texts, with independence of the condition they have read. Finally, and different from the researches done with younger students, the rhetorical competence at these ages did not have a moderating effect on the impact of the rhetorical devices. This can be interpreted as that all the students had the necessary level to benefit from the rhetorical devices included in the text.

When Instructional Software is Integrated: A Study of GeoGebra in High School Mathematics Teaching

Keywords: Mathematics, Quasi-experimental research, Secondary education, Technology

Presenting Author: Shiyu Liu, Ocean University of China, China; **Co-Author:** Jingyu Qiu, Ocean University of China, China

This study investigated how integrating GeoGebra into classroom teaching may affect high school students' learning of algebra. One hundred and four ninth-grade Chinese students participated in this research, where they were randomly assigned to either the experiment or control group. While the former were taught with GeoGebra on fundamentals of functions, the latter were taught by the same teacher in a traditional manner. Over the span of eight weeks, the experiment group improved significantly more than the control group in both conceptual understanding and competence in applying effective learning strategies. Nonetheless, no significant difference was found in their learning motivation. This work has important implications for future research about impacts of employing mathematics software on different aspects of learning.

Which factors influence students' learning activities in religious education?

Keywords: Religious studies, Secondary education, Social aspects of learning and teaching, Survey Research

Presenting Author: Alexander Unser, TU Dortmund University, Germany

Stimulating learning activities is an essential task for teachers to achieve learning outcomes in class. In religious education (RE) research, however, there is little knowledge about (subject-specific) factors which influence learning activities. Therefore, the present study aims at providing empirical knowledge about relevant factors in RE and their influences. To consider these influences, the present study builds on Emirbayer and Mische's (1998) conceptualisation of agency and their distinction between general (habitual) characteristics and context-specific skills as factors of action. The following research questions guide the study: Which habitual characteristics influence the students' learning activities in RE? Is this influence mediated by context-specific skills? The data of the study was gathered by a survey among ninth-grade RE students (N=952) from different types of schools in the Federal State Baden-Wuerttemberg (Germany). Case vignettes were presented to survey the learning activities. Structural equation modelling (performed with the statistical software R and the packages lavaan and lavaan-survey) was used to analyse the data. The nested data structure was considered by an aggregate design-based modelling approach (Muthén & Satorra, 1995). The results show that students' religiosity and cultural capital are relevant habitual characteristics which influence their learning activities in RE. Furthermore, it is found that the influence of both factors is mediated by students' context-specific skills (e.g. to perceive the relevance of learning contents). These findings can help RE teachers to better stimulate learning activities of students with different habitual characteristics, e.g. by specific relevance interventions.

How do classroom goal structures shape secondary school students' achievement goals?

Keywords: Goal orientation, Motivation and emotion, Secondary education, Teaching/instruction

Presenting Author: Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:** Esther Canrinus, University of Agder, Norway; **Co-Author:** Els van Rooij, University of Groningen, Netherlands

In classrooms where teachers focus on learning and effort, instead of on normative standards and social comparison, mastery goals are enhanced. This type of classroom can be endorsed by focusing on the following structures: task design, autonomy, recognition, grouping, evaluation, and time (TARGET). Based on data from 501 students, divided across three secondary schools in the Netherlands, we investigated profiles of achievement goals in terms of classroom goal structures and personal goals. A two-step cluster analysis indicated two clusters, the first scoring highest on all classroom goal structures and the second scoring lowest on the classroom goal structures. These two clusters differed in mastery-approach and avoidance goals. Students in the CGS_high cluster scored high on mastery-approach and avoidance goals. Also, these were students from the younger classes. We found no difference in performance goals or in other background variables based on cluster membership. Our study provides more insight in how classroom structures are related to goals that focus on understanding/competence. Furthermore, our study underlines the importance of examining variables from a person-oriented perspective.

Reading Comprehension of Immigrant Mothers' Children in Mathematical Word Problems

Keywords: Cultural diversity in school, Learning analytics, Mathematics, Reading comprehension

Presenting Author: Yun Hsia Pai, National Tsing Hua University, Taiwan; **Co-Author:** Su-Wei Lin, National University of Tainan, Taiwan; **Co-Author:** Chia-Huang Chen, National Taichung University of Education, Taiwan; **Co-Author:** Ching-Shu Chen, Tainan University of Technology, Taiwan

This study aims to investigate the difference of mathematics reading comprehension ability between the Southeast Asian immigrant mothers' children and native-born mothers' children. The mathematics reading comprehension test was designed by the author and was conducted to analyze the students' reading comprehension ability. The items in this test consist of mathematical semantics understanding (SU), mathematical syntactic and semantics reasoning (MSSR) and information deducing (ID). 528 participants of 6th grader accepted the test. This study adopted mixed design of two-way ANOVA. The result showed that there is no significant difference in full mathematics reading comprehension between children with the Southeast Asian immigrant mothers and with native-born mothers. However, there were significant differences among semantics understanding, mathematical syntactic and semantics reasoning and information deducing in each individual group.

Relations between contribution to school and community, self-regulation, achievement and depression

Keywords: Motivation and emotion, Out-of-school learning, Secondary education, Self-regulation

Presenting Author: Marina Hirnstein, University of Bergen, Norway; **Co-Author:** Ana Kurtovic, University of J. J. Strossmayer Osijek, Faculty of Humanities and Social Sciences, Croatia; **Co-Author:** Gabrijele Vrdoljak, Faculty of Humanities and Social Sciences Osijek, Croatia

Despite the growing attention given to youth civic engagement, as well as concerns regarding youth being too self-centered and disengaged from their communities, students' contribution to their schools and communities and its role in education have not been the subject of much research. Even in Western countries who have included development of citizenship competence in their national or school curricula, its value is often overseen compared to other, more academic subjects, possibly due to the lack of understanding of its benefits to positive youth development. The study reported here aimed at investigating the prevalence and potential benefits of secondary students' active contribution to their schools and communities. Secondary school students anonymously filled out a questionnaire including questions regarding their age, gender, academic achievement, self-regulation, depression, and time they spent engaged in behaviors

aimed at contributing to their schools and communities, such as helping one's family, friends or neighbors, mentoring peers, volunteering in one's community and participating in school organizations or boards. Students' self-reports showed generally low levels of students' engagement in their schools. They report rarely mentoring peers or volunteering in their communities. Helping their families and friends was their biggest contribution. Results showed significant effect of student contribution to their schools and communities on the level of depressive symptoms, partially mediated by their overall self-regulation skills and school achievement. Potential benefits of engaging students in their schools and communities for their personal well-being as well as their schools and communities are discussed.

Session J 21

14 August 2019 10:15 - 11:45

Seminar Room - S14

Poster Presentation

Higher Education, Instructional Design, Learning and Instructional Technology

Higher Education

Keywords: Case studies, Computer-assisted learning, Higher education, Instructional design, Language (Foreign and second), Learning analytics, Metacognition, Motivation and emotion, Pre-service teacher education, Quasi-experimental research, Second language acquisition, Self-regulation, Student learning, Survey Research, Technology

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition

Chairperson: Loren Marulis, Connecticut College, United States

When prompts do not support learning outcome & learning analytics fail to provide useful information

Keywords: Higher education, Learning analytics, Quasi-experimental research, Self-regulation

Presenting Author: Clara Schumacher, University of Mannheim, Germany; **Co-Author:** Dirk Ifenthaler, University of Mannheim, Germany

Successful learning in higher education requires self-regulatory behavior of learners. As many students do not regulate accordingly, prompts are considered to support their learning through brief interventions. However, prompts need to be aligned with learners' needs, goals, and activities. Learning analytics may provide useful information about learning behavior for designing suitable interventions in digital learning environments. The purpose of this study was to investigate if prompts impact the learning outcome and if trace data are related to the learning outcome. A quasi-experimental study was conducted in which students were confronted with two independent learning units focusing on information technology and marketing. The conditions of the experimental groups were varied with regard to the received prompts, being (a) cognitive, (b) metacognitive, or (c) cognitive, metacognitive, motivational, and resource-related. The learners' digital footprint was tracked while they were interacting with the digital learning environment. Findings indicate that the prompting interventions did not relate to the learning outcome. In addition, trace data had limited capacity for predicting the learning outcome. Further research is required to investigate various types of prompting in authentic digital learning scenarios. Learning analytics information need to be studied further to validate their predictive power if when small traces of data are available.

Can strategy instructions support the self-regulated use of retrieval practice in higher education?

Keywords: Computer-assisted learning, Higher education, Instructional design, Self-regulation

Presenting Author: Marloes Broeren, Avans Hogeschool / Avans University of Applied Sciences, Netherlands; **Co-Author:** Peter Verkoefen, Erasmus University Rotterdam, Netherlands; **Co-Author:** Anita Heijltjes, Avans University of Applied Sciences, Netherlands; **Co-Author:** Guus Smeets, Erasmus University Rotterdam, Netherlands; **Co-Author:** Lidia Arends, Erasmus University Rotterdam, Netherlands

Being successful and effective in higher education requires learners to be able to self-regulate their learning (Bjork, Dunlosky, & Kornell, 2013). Previous experimental research revealed that an instructional intervention increased students' self-regulated use of retrieval practice and subsequent test performance (Ariel & Karpicke, 2017). The question addressed in this study was whether these effects - found in a controlled experiment with simple learning tasks - generalize to a real-life higher education environment with more complex materials. Therefore, we conducted a field experiment which was embedded in a higher vocational course program on marketing communication. To test the effects of instructions, we compared two groups: an experimental group that received strategy instructions on retrieval practice and a control group that received neutral instructions. During three 45-minute study sessions, students used an online learning environment to study key concepts of marketing communication. Instructions were provided during sessions 1 and 2; no instructions were provided in the third, transfer session. We found that in session 1 and 2, the experimental group did not differ significantly from the control group on self-regulated use of retrieval practice. In the transfer session, we found that the experimental group displayed a significantly larger self-regulated use of retrieval practice than the control group. No effects were found on test performance. This experiment shows that an online intervention can support students in using retrieval practice in a self-regulated way and that previous effects found in a controlled setting apply in real-life learning environments with more complex materials.

Learning patterns, academic stress and performance in undergraduates

Keywords: Higher education, Motivation and emotion, Self-regulation, Student learning

Presenting Author: Antonio Vega Martínez, Universidad Autonoma de Barcelona, Spain; **Co-Author:** Jose Reinaldo Martinez-Fernandez, Universitat Autònoma de Barcelona, Spain; **Co-Author:** Jordi Coiduras, Universitat de Lleida, Spain; **Co-Author:** Jordi García-Oriols, Autonomous University of Barcelona, Spain

This study analyses the relation, between learning patterns, academic stress and performance in first year at university. 146 Spanish students take part and informed about learning patterns, stressful factors, reactions and coping strategies. Analysis techniques focused on the subjects were applied (Kluster analysis), descriptive and relations' analysis (χ^2 chi-square and Pearson's correlations). Less reactions and higher coping strategies were found in the groups with a meaning directed pattern (MD) or application directed (AD). Contrary to this, more stress difficulties, and less coping strategies were noticed in groups characterized by reproduction directed pattern (RD) or undirected (UD). The first ones (MD, AD) are related significantly with better performance. The results that emerge allow a better comprehension of the management of the learning activity in the first stage at university; and they inspire to the design of training actions that help in the transition to university.

Experiences on self-regulation among students in a flipped classroom learning environment

Keywords: Case studies, Higher education, Pre-service teacher education, Self-regulation

Presenting Author: Sanna Väisänen, University of Eastern Finland, Finland; **Co-Author:** Anni Arffman, University of Eastern Finland, Finland; **Co-Author:** Laura Hirsto, University of Helsinki/ University of Eastern Finland, Finland

The aim of the study was to determine what kinds of experiences on self-regulation students of educational science had during a study unit carried out with the flipped classroom approach. Theoretical perspectives included Zimmermann's (2000) model of self-regulation, self-determination theory (Ryan & Deci, 2000) and flipped classroom (Bergman & Sams, 2012). Experiences were elicited through deep interviews of six students. According to results, students' forethoughts towards the study unit varied between experiences of meaning and internal interest, while others made no reference to such in the interviews. Perspectives to students' personal study planning indicated that there was variation in the extent to which student set goals and expectations to one's learning. Various methods were explicated through which students regulated their learning. Students' experienced external support and social relationships as significant for their learning. These included both guidance arranged as part of the study unit as well as peer support. The results will be discussed in light of the theoretical perspectives and issues in developing flipped classroom environments to support student learning.

Ace Your Self-study: Using A Mobile Device App to Support Self-regulated Learning

Keywords: Higher education, Metacognition, Self-regulation, Technology

Presenting Author: Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:** Kevin Kamermans, Erasmus University Rotterdam, Netherlands;

Co-Author:Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Without instructional support, students overestimate their understanding and memory of learning materials, which can have detrimental effects on the learning process. Most students do not get instruction about how to study and students are largely unaware of learning strategies to help them to study effectively. Prompting both cognitive and metacognitive strategies can be effective to support self-regulated learning (SRL). In the current study a mobile application, the Ace your self-study app, was used to prompt both cognitive and metacognitive strategies in order to support student's SRL activities while learning. Using a 2x2 between-subjects design we investigated the effect of using the Study app and making JOLs during a 5 week course. Participants were 92 undergraduates, who were randomly assigned to conditions: 1) No Support, 2) JOLs, 3) Study app, and 4) Study app with JOL. We expected participants who were in the Study app and JOL condition to outperform the students in the Study app only condition, who in turn were expected to outperform the JOL only condition, which was expected to outperform the control condition in terms of more accurate monitoring judgments and higher grades. Results suggest that the Study app users were satisfied with the strategies they used and that they have learned to a moderate extent. Self-reported metacognitive learning strategies increased for all students regardless of the condition they were in. Also, students who made JOLs throughout the course spent more time studying. Future research could investigate the use of the Study app further.

Oral Fluency Improvement through Discourse Marker Practice in a Japanese University EFL Class

Keywords: Higher education, Language (Foreign and second), Second language acquisition, Survey Research

Presenting Author:Brian Wojtowicz, Kwansai Gakuin University, Japan

In numerous EFL classes, oral fluency is commonly underdeveloped in comparison to reading, writing, and listening fluency and this has become noticeably problematic in many Asian EFL classes and courses for various understandable and legitimate reasons. The presenter addresses this concern by referencing literature from Butler (2011), Onoda (2014), Zhang, Y. (2009), and others before explaining the results of a survey conducted by over 1200 Japanese high school EFL students that revealed a distinct lack of classroom English speaking time. Next, the concept of communicative free-production tasks, as identified by Rossiter et al. (2010), and Hasselgreen's (2005) definition of oral fluency will be briefly addressed before the presenter explains the success of an in-class communicative free-production activity that focused on unassessed phatic communicative output confluent with explaining some features of English oral fluency which are usually unknown by EFL learners, such as: hesitation function, discourse (small word) markers, and turn boundaries. The presenter concludes by discussing how the majority of surveyed students from two Japanese EFL university classes identify communicative free-production tasks as being more enjoyable and more important for improving their overall English ability than topical speaking tasks, reading, writing, and listening activities after the completion of their one year integrated four skills EFL class. Speaking improvement is proven through student video self-analysis results showing a consistent increase in L2 discourse marker usage and a decrease in L1 discourse markers.

Session K 1

14 August 2019 12:00 - 13:30

Lecture Hall - H05

Symposium

Higher Education, Motivational, Social and Affective Processes

"Should I stay or should I go?" – Adaptation and drop-out in Higher Education

Keywords: Achievement, At-risk students, Educational attainment, Educational Psychology, Higher education, Motivation and emotion, Quantitative methods

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Francisco Peixoto, Portugal

Organiser: Francisco Peixoto, Portugal

Organiser: Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Discussant: Stuart Karabenick, University of Michigan, United States

Adaptation to higher education is a multivariate phenomenon with great individual differences as a result of both individual and contextual factors. Less adapted to the university students have higher probabilities for poor academic outcomes and academic failure, for non-completion and drop-out. They are also less satisfied with their studies and university life, they cope with new challenges less successfully, experience poor social support and less positive emotions, and are inclined for mental health difficulties. Similarly, drop-out has been empirically linked with a large number of factors including individual, socio-demographic and institutional-academic ones. Drawing on recent studies in four countries participating in a European project titled "Supporting University Students At Risk of dropping out" (SUnStAR), the papers in this symposium present new evidence on the facets of both successful adaptation to university and drop-out intentions. The first paper (Portugal and Germany) presents the rationale and the aims of SUnStAR. The second paper (Serbia) examines the differential predictors of adaptation and drop-out out of a large number of individual, institutional and socio-demographic factors. The third paper (Portugal) examines a wide range of individual and institutional factors to successful adaptation to university and offers insights about their differential contribution to satisfaction with academic life and to academic achievement. The fourth paper (Greece) focuses on the motivational and emotional profile of students at-risk for dropping out. All papers together underline the complexity of adaptation and drop-out in higher education and the necessity university students to have the support they need to accomplish their studies.

University students at risk for dropping out: Their motivational and emotional profile

Presenting Author:Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Stamovlasis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Constantine Aivazidis, Aristotle University of Thessaloniki, Greece; **Co-Author:**Konstantina Falanga, Aristotle University of Thessaloniki, Greece

University students' drop-out has been a widely studied phenomenon and numerous factors have been associated with it including individual, social-demographic, and institutional-academic factors. Among the individual factors, the contribution of achievement motivation and emotions has been acknowledged both for drop-out and for adaptation to higher education. The present study is part of a broader European project aiming to support higher education students at risk of dropping out. Specifically, the aim of the present study was to identify those students who are at risk to quit their studies and to examine their motivational and emotional profile in comparison with the profile of students who are well adjusted in higher education. A total of 930 university students (585 females, 62,9%) completed the survey electronically. Measures included intention to dropout, intrinsic and extrinsic motivation, self-efficacy, attainment value, study satisfaction/interest, intellectual/personal development, cost, positive and negative emotions. Principal component analysis supported the factorial structure of all scales. A two-step cluster analysis indicated two distinct groups: (i) the well-adjusted students ('Stable', 75.27%) who did not express thoughts about abandoning their studies, and (ii) the students at risk for dropping out (24.73%) who had considered at least once to drop out. At-Risk students compared to the 'Stable' ones had the lowest mean scores in all variables except negative emotions and cost, for which they had the highest mean scores. The results will be discussed in light of current theory and evidence and implications for university students will be pointed out.

"Am I Happy at the University?" – Factors contributing to adaptation to Higher Education

Presenting Author:Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:**Leandro Almeida, University of Minho, Institute of Education, Braga, Portugal; **Co-Author:**Maria do Céu Taveira, University of Minho, Portugal; **Co-Author:**José Castro Silva, ISPA-Instituto Universitário, Portugal; **Co-Author:**Maria João Gouveia, ISPA – Instituto Universitário, APPsyCI, Lisboa, Portugal

Research on academic adaptation in higher education identifies a significant number of factors, involving individual, social-demographics, and institutional-academic variables. The main goal of this study was to analyse the contribution of individual and academic-institutional factors to satisfaction and academic achievement in University students. Participants were 704 students attending two Portuguese universities (79.6% women), aged from 18 to 54 years old ($M=20.7$, $SD=5.01$) and with one to 11 ($M=3.61$, $SD=2.04$) completed semesters. Measures of individual (motivation, use of learning strategies, self-efficacy, emotional stability) and institutional-academic (identification with university and field of studies, study organisation and teaching quality, quality of the contact

with teachers, perceived support) factors were included in a single survey, at the end of the school year. Results of hierarchical regression analyses showed that individual and institutional-academic factors explained more variance in satisfaction with academic life than in academic achievement. Results will be discussed in terms of the implications for students' adaptation to Higher Education.

Predicting study satisfaction and drop out intentions in higher education: the case of Serbia

Presenting Author:Ksenija Krstic, University of Belgrade, Serbia; **Co-Author:**Ivana Stepanović Ilić, University of Belgrade, Serbia; **Co-Author:**Marina Videnović, University of Belgrade, Serbia; **Co-Author:**Oliver Tošković Tošković, University of Belgrade, Serbia

Higher education is an influential factor supporting socio-cultural and economic development of both individuals and societies. Lowering the drop-out rate among HE students is one of the main goals of the EU strategy for jobs and growth (Europa 2020). Dropping out from HE is universal problem having significant economic and academic consequences, at the individual, institutional, and societal levels. For drop out as a complex and multifactorial problem, there is no one solution that can be applied in all situations and in all HE institutions. Research presented here is a part of a large, international project SunStar, focused on development of online learning platform as a support for students at risk of dropping out. The aim of this study is to determine which factors have the most predictive value for students' study satisfaction and drop out intentions in Serbian context. For purpose of this study a sample of 673 students (mean age 21.39, 79% females) participated in an online survey which included several aspects of students' evaluation of their university and study. Multiple regression model showed that 72% of study satisfaction was explained by following dimensions: study organisation, self-evaluation certainty, emotional positivity, intrinsic motivation, intellectual development, relevance to practice and living conditions. Similarly, 39% of drop out intentions can be explained by dimensions: help-seeking, self-efficacy, attainment, emotional positivity, emotional support, self-evaluation certainty, living conditions, grades and funding. Those dimensions refer to both institutional and individual factors. The role of students' socio-demographic characteristic and types of study programs will be also discussed.

"May I Help you?" – The project SUnStAR: Supporting University Students at Risk of Dropping-Out

Presenting Author:Philipp Nolden, RWTH Aachen University, Germany; **Co-Author:**Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:**Marold Wosnitza, RWTH Aachen University, Germany; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece

Success in higher education is vital for the labour market, social equality and economic growth and therefore highly qualified professionals are indispensable for each society. Nonetheless, in most countries the completion rate in tertiary education is below 80%. Therefore, the phenomenon of university drop-out has been widely studied and numerous factors have been associated with it. However, there is still a need for research focusing on the contexts within which drop-out occurs informing the development of effective prevention strategies within various contexts. In this line the project SUnStAR (Supporting University Students at Risk of Dropping-Out) was designed to develop evidence-based measures of drop-out prevention. In this presentation we will introduce the rationale of SUnStAR and its main components: Firstly, the SRT, an online self-reflection tool with feedback intending to enable students to reflect on their situation at university, and secondly building on this diagnosis an self-regulated online learning tool and connection to institutional sources of support.

Session K 2

14 August 2019 12:00 - 13:30

Lecture Hall - H10

Symposium

Cognitive Science, Higher Education, Learning and Special Education

Mathematical giftedness and expertise

Keywords: Achievement, Cognitive skills, Competencies, Educational attainment, Higher education, Mathematics, Science education, Special education

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs

Chairperson: Roland H. Grabner, University of Graz, Austria

Chairperson: Bert De Smedt, KU LEUVEN, Belgium

Organiser: Roland H. Grabner, University of Graz, Austria

Organiser: Bert De Smedt, KU LEUVEN, Belgium

Discussant: Jake McMullen, University of Turku, Finland

There is increasing awareness and evidence that high mathematical abilities are an essential foundation for progress in modern technological societies. Most of previous research, however, has focused on typical mathematical development and low achievement in mathematics (in particular dyscalculia). Comparatively little is known about the mechanisms underlying high mathematical abilities and achievements as well as effective educational approaches that optimally support these high abilities. In addition, there are continuing discussions about the definition of mathematical giftedness, mathematical expertise and their constituting components. The aim of this symposium is to present different lines of current research on individuals with high mathematical abilities and to initiate an integrative discussion of this research with regard to the concepts of mathematical giftedness and expertise. The symposium consists of three empirical and one theoretical paper. The empirical papers involve individuals with high mathematical abilities in different developmental phases (from primary school to university students) and address cognitive and motivational correlates as well as outcomes of high mathematical abilities. The theoretical paper deals with the relationship between mathematical creativity and expertise as major components of mathematical giftedness. The discussant of the symposium will finally provide the basis for an integrative open discussion, with specific attention to educational implications of the four papers.

The domain-specific and domain-general cognitive correlates of high achievement in mathematics

Presenting Author:Merel Bakker, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium

Several domain-specific and domain-general cognitive factors have been brought forward as predictors of individual differences in mathematical development. The current literature has focused predominantly on typical or delayed mathematical development. There is little systematic research on high math-ability children. The purpose of this study was to clarify the cognitive correlates of children's high achievement in mathematics. The performance of children with high math achievement was compared to that of children with average math achievement on several domain-specific and domain-general cognitive tasks. Participants were 64 Flemish children aged 8 to 10. To become part of the high-achieving group, children had to score above the 90th percentile of the standardized curriculum-based mathematical achievement test (LVS) at two consecutive time points. We matched the high-achieving children, based on class group, gender and age, with a child from the average-achieving group, who had to score between the 30th and 70th percentile of the same mathematical achievement test at two consecutive time points. Children completed two domain-specific tasks: a symbolic number comparison task and a symbolic number order task. The domain-general tasks were a backward Corsi block tapping test, backward digit span, and block design. We found a group difference in favor of the high-achieving group for the number order task, but not for symbolic comparison. There was a group difference in favor of the high-achieving group for spatial ability, but not for working memory. Further research, perhaps focusing on complex mathematical abilities, is needed to characterize young children with high achievement in mathematics.

Top 5% math students worldwide: A meta-analysis of gender differences in achievement and motivation

Presenting Author:Franzis Preckel, University of Trier, Germany; **Co-Author:**Lena Keller, University of Potsdam, Germany; **Co-Author:**Jacquelynne Eccles, University of California, Irvine, United States; **Co-Author:**Martin Brunner, University of Potsdam, Germany

The present study examined gender differences in top-performing math students' achievement, achievement profiles, and achievement motivation in mathematics, reading, and science across 80 countries worldwide. To this end, we meta-analyzed data from five representative, international, high-quality samples of the Programme for International Student Assessment (PISA, $N = 175,744$, 15-year-olds). On average, male students were slightly overrepresented in the top 5% in mathematics (mean female-to-male student ratio 1:1.44). The proportion of females in the top 5% in mathematics and gender gaps within this group varied strongly across countries. Male students slightly outperformed female students in mathematics (mean $d = 0.15$), whereas female students possessed better reading skills (mean $d = -0.62$). Gender differences in science achievement were negligible (mean $d = 0.00$). Male students demonstrated a

distinct mathematics- or science-oriented achievement profile, whereas female students' profiles were more balanced across domains. Gender differences in achievement motivation were negligible or of small effect size with the following exceptions: male students reported higher math intentions and self-efficacy (moderate effects) and female students reported more interest, more enjoyment, and a higher verbal self-concept (moderate to large effects).

Predicting academic achievements of high ability STEM students

Presenting Author:Michal Berkowitz, ETH Zurich - Research on Learning and Instruction, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland

We investigated whether ability differences among STEM students were predictive of achievements during the first undergraduate year. In particular, we examined the role of spatial ability for achievements in math-intensive domains. 317 undergraduate students at ETH Zurich (150 from mechanical engineering and 167 from math-physics) were assessed on multiple measures of spatial, verbal and numerical abilities. The effects of specific and general ability factors on student's achievements were estimated in structural equation models. Although scores on ability tests were mostly at the upper scale range, differential effects on achievements were found: spatial ability accounted for achievements in an engineering design course beyond numerical, verbal and general reasoning abilities, but not for math and physics achievements. Math and physics achievements were best predicted by numerical, verbal and general reasoning abilities. Broadly, the results provide evidence for the predictive power of individual differences in cognitive abilities even within highly competent groups. More specifically, the results suggest that spatial ability's role in advanced STEM learning, at least in math-intensive subjects, is less critical than numerical and verbal reasoning abilities.

Creativity and expertise in mathematics - an egg or a chicken?

Presenting Author:Roza Leikin, University of Haifa, Israel

Mathematical giftedness can be seen as a combination of mathematical expertise and mathematical creativity. At the same time, the relationship between mathematical creativity, knowledge and expertise is a phenomenon, which may be termed a "creativity-knowledge paradox": on the one hand, having knowledge is a necessary condition for a person to be creative; on the other hand, creativity is considered a central mechanism of knowledge construction. In this paper, I suggest a theoretical underpinning of the relationships between creativity, expertise and mathematical giftedness, which is based on a series of studies that explore first connections between mathematical ability and creativity in school students and second the development of expertise and creativity using creativity-directed activities. Five hypothesis are raised and open new windows for the studies focusing on mathematical creativity and expertise.

Session K 3

14 August 2019 12:00 - 13:30

Lecture Hall - H07

Symposium

Assessment and Evaluation

Coding and analysing teacher feedback quality in classroom situations

Keywords: Assessment methods and tools, Content analysis, Mathematics, Mixed-method research, Primary education, Self-regulation, Teaching/instruction, Video analysis

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Robbert Smit, University of Teacher Education St.Gallen, Switzerland

Discussant: Maria Araceli Ruiz-Primo, Stanford University, United States

The role of feedback is essential for learning. It is most powerful when given in a descriptive form to help the learner change erroneous knowledge components and, thus, improve achievement (Ruiz-Primo & Brookhart, 2018). A recent shift in research on feedback tries to integrate the role of the learner in the feedback process and to focus more on the feedback dialogue. Our symposium presents four papers studying feedback quality with the help of promising methods, namely video- and audio-analysis. We will present different attempts to code feedback quality and it will be interesting to compare these approaches with theoretical descriptions (e.g. Hattie & Timperley, 2007). In the starting presentation video technology is used to investigate how dialogic feedback is perceived by students and teachers as part of reflective practice. The second video-study is about different foci of the teachers' feedback within patterns of interactions. There is a prevalence of feedback related to the task, but a closer look at the lesson sequence provides a more detailed picture. In the third presentation the aim of the feedback is to support the students' strategies for mathematical problem solving. In addition, the researchers look at the differentiated use of the feedback by the students. Finally, the fourth study tries to capture feedback quality in connection with mathematical rubrics. The aim is to connect qualitative video data with quantitative belief and achievement data. Our competent discussant will help us to review these undertakings in a beneficial way.

Using video technology to examine teacher-student perceptions of oral feedback interactions

Presenting Author:Lenore Adie, Australian Catholic University, Australia; **Co-Author:**Fabienne van der Kleij, Australian Catholic University, Australia; **Co-**

Author:Joy Cumming, Australian Catholic University, Australia

Feedback has long been advocated as one of the most effective means to enhance student learning. However, reviews of feedback have identified that feedback may be differentially effective for students depending on how it is received. Although much research has focused on effective feedback practices, less research has focused on how it is received, and how it may or may not result in enhanced learning. In this presentation we report on two research projects conducted in Australian secondary schools that used video technology to investigate the reception of feedback and feedback as a dialogic interaction. The interactions include teacher to student one-to-one oral feedback, and teacher to class feedback. The methodology drew on video stimulated recall (VSR) of recorded feedback to gain the perspectives of both teachers and students on their perceptions of the interaction. The findings identify the value in using video technologies to interrogate the intricacies of feedback interactions for researchers, as well as the value for teachers and students as reflective practice.

Classroom interaction in elementary school: The role of feedback

Presenting Author:Vera Monteiro, ISPA - Instituto Universitário, Portugal; **Co-Author:**Lourdes Mata, Instituto Universitário / CIE - ISPA (Research Center in Education), Lisbon, Portugal; **Co-Author:**Natalie Nobrega Santos, ISPA - Instituto Superior de Psicologia Aplicada, Portugal; **Co-Author:**Christina Sanches, ISPA - Instituto Superior de Psicologia Aplicada, Portugal; **Co-Author:**Marta Gomes, ISPA - Instituto Superior de Psicologia Aplicada, Portugal

The construction of knowledge is a socio-culturally mediated process affected by physical and psychological tools. Therefore, the quality of classroom interactions, particularly that of the feedback exchanges between teacher and students, is very important for the learning and teaching process. Thus, the main aim of this research is the analysis of classroom interactions, with the purpose of studying the quality of teacher feedback in the open moves used by teachers and students throughout the learning process and especially in each of the different moments of the lesson: Introduction of new contents, practice/application and correction. The presented qualitative study investigated interactions involving 5 teachers and 82 students. Trained observers coded videos of 24 lessons. Employing qualitative coding procedures, the study provides a typology of I-R-F (interaction initiated by the teacher (I), student response (R) and teacher feedback (F)) and I-F (interaction initiated by the student (I) and teacher feedback (F)) patterns of interactions based on different levels of focus of the teachers' feedback. These patterns are fairly consistent across lessons, suggesting a prevalence of the I-R-F structure, where the teachers focused frequently on providing corrective feedback regarding the *task*. Findings also provide a descriptive basis for the assertion that, throughout the lessons, teachers try to activate and work inside the students' ZDP (Zone of Proximal Development) in order to promote learning. However, they are not too worried about whether their students will be able to self-regulate their learning process.

Formative feedback on primary students' mathematical reasoning

Presenting Author:Andreia Balan, SFF Helsingborg, Sweden; **Co-Author:**Anders Jonsson, Kristianstad University, Sweden

This study aims to investigate the use of an approach, where heuristics for mathematical problem-solving is taught by the use of process level formative feedback and mathematical reasoning, supported by the use of a scoring rubric. The study design is quasi-experimental with three intervention groups and three control groups from three different primary schools (students 10-11 years old). The intervention and control groups are organized in pairs with classes

taught by the same teacher. Students are presented with problem-solving tasks at three successive occasions. After attempting to solve the problem, the teacher asks the students to explain and argue for their solutions. The teacher then provides oral feedback on students' reasoning and heuristics, based on the rubric. The students can thereby use the feedback from one occasion to inform their performance on the next problem-solving task. Data and analyses include: a) pre-, and post-tests on students' mathematical performance and motivation; b) qualitative analysis of teachers' feedback; and c) analyses of students' solutions to mathematical problem-solving tasks. Initial analyses suggest that teachers are successful in formulating their feedback as future-directed strategies, which the students may use when solving future tasks. Initial analyses also suggest that some students readily make use of these strategies, while others do not. In the latter case, students may be able to identify weaknesses or errors in their solutions, but not apply the heuristics to, for instance, find other (more adequate) solutions to the same problem. Future analyses will investigate these findings further.

Video analysis of formative feedback for mathematical reasoning

Presenting Author:Patricia Bachmann, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Robbert Smit, University of Teacher Education St.Gallen, Switzerland

Teacher feedback is crucial for student learning in the classroom. As part of a meta-analysis, Hattie (2008) could show that feedback is one of the most effective factors teachers can apply to foster student learning. However, not all forms of feedback are equally beneficial (Hattie & Timperley, 2007). Descriptive feedback e.g. is more beneficial for learning as evaluative (Ruiz-Primo & Brookhart, 2018). The relationship, however, between features of feedback as part of classroom dialogue and learning outcomes is still not very well explored (Howe & Abedin, 2013). As part of our preceding project "Learning with rubrics" we videotaped 20 primary school teachers supporting their 5th or 6th grade students while they were solving mathematical reasoning tasks. As a means to assess the teachers' feedback process and quality we developed a video coding manual with three key dimensions. We present frequencies and rating values that will allow for the testing of relationships with existing student outcomes for mathematical reasoning and with student perceptions/self-beliefs.

Session K 4

14 August 2019 12:00 - 13:30

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Assessment and Evaluation, Learning and Social Interaction, Teaching and Teacher Education

Interaction in ECEC: findings from group-oriented v individualized perspectives with (IN)CLASS

Keywords: Assessment methods and tools, Early childhood education, Educational Psychology, Learning approaches, Psychometrics, Quantitative methods, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Cathleen Bethke, Leibniz University Hannover, Germany

Organiser: Heike Wadepohl, Leibniz University Hanover, Germany

Discussant: Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates

Organizer: Dr. Heike Wadepohl, Leibniz University Hannover Chair: Cathleen Bethke, Leibniz University Hannover Discussant: Prof. Dr. Antje von Suchodoletz, NYU Abu Dhabi
General abstract
Numerous international studies refer to the importance of high quality interaction processes in early childhood education and care (ECEC) for children's socio-emotional, motivational and cognitive learning and development (see Anders et al., 2012; Burger, 2010; Pianta, 2015; Sylva et al., 2006). To assess interaction quality there are currently two basic approaches in literature: assessing quality scores for the whole classroom (group-oriented perspective) vs. tracking the interactions of one (or more) specific children in the classroom (individualized perspective). In this symposium, we present current results, methodological questions and determinants on interaction quality in ECEC-contexts using either the group-oriented Classroom Assessment Scoring System (CLASS Pre-K: Pianta et al., 2008) or the individualized Classroom Assessment Scoring System (inCLASS: Downer et al., 2010). The discussion of Antje von Suchodoletz will outline methodological challenges of the two approaches and implications for research and practice.

The association between teacher stress and quality of teacher-child interactions: Moderating factors

Presenting Author:Viola Penttinen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study examined factors moderating the relationship between teacher stress and the quality of teacher-child interactions. Moderators included group size, teachers' work experience, and their recovery from work. Participants of the study were 47 Finnish preschool teachers. Data consisted of teacher questionnaires and video recordings assessed with Classroom Assessment Scoring System at two time points: preschool autumn and spring. First, the results of cross-lagged path models showed that teacher stress predicted negatively subsequent emotional support and classroom organization: Teachers who experienced more stress in autumn had a lower quality of emotional support and classroom organization in their classroom in spring. Teacher stress also predicted negatively subsequent instructional support, albeit marginally significantly. Second, preliminary results of multigroup analysis showed that work experience moderated the relationship between teacher stress and all three domains of interactions (emotional support, classroom organization and instructional support). Group size moderated the association between teacher stress and emotional support and classroom organization. In terms of teachers' recovery from work, psychological detachment moderated the relationship between teacher stress and emotional support, classroom organization and instructional support. Findings from this study can be used to improve teacher training and to develop interventions to support teachers' wellbeing.

The impact of play settings/ areas on the quality of teacher-child-interactions

Presenting Author:Cathleen Bethke, Leibniz University Hannover, Germany; **Co-Author:**Heike Wadepohl, Leibniz University Hanover, Germany

The recent debate on the effects of early childhood education and care (ECEC) has underlined the importance of high-quality teacher-child interactions as a central driver for children's learning and development. International studies indicate, that the quality of teacher-child- interactions during daily preschool routines differ with regard to the interaction domains; in general teachers receive mid to high scores in the CLASS-domains Emotional Support and Classroom Organization, whereas the Instructional Support domain is scored lower (see Pianta, 2015; Wadepohl, 2016). With regard to possible influencing factors on teacher-child-interactions, some studies mention the context within the interactions take place (e.g. morning vs. afternoon, free-play vs. planned activity vs. meal; Mackowiak et al., 2015; von Suchodoletz et al., 2014; Wertfein et al., 2015). This paper focuses on contextual factors within free-play situations and investigates the impact of the play setting/ area on different aspects of teacher- child-interactions. Data analysis relies on free-play videos of teachers working in German preschools. Interaction quality is measured via the CLASS Pre-K system; the play settings/ areas are coded for each CLASS-cycle. Current results with a preliminary sample show significant differences in two of the three global interaction domains across distinct play settings/ areas indicating that specific play settings/ areas can foster a higher quality of teacher-child-interactions.

Examining the factor structure of the Individualized Classroom Assessment Scoring System (inCLASS)

Presenting Author:Eva-Maria Embacher, Leopold-Franzens-Universität Innsbruck, Austria; **Presenting Author:**Wilfried Smidt, University of Innsbruck, Austria

Results based on research demonstrate the significance of children's interaction quality in preschools, which has been shown to be predictive for their linguistic-cognitive and social-emotional competencies. Therefore, investigating the conditions of high interaction quality in preschools is an important task. There are different approaches to measure children's interaction quality in preschools: In many studies, interaction quality has been examined on the preschool class level with the consequence that information about interactions on the individual level of children is not available. In contrast, studies, which provide a more detailed picture about individual experiences by focusing on the interaction quality of individual children, are less common. A promising tool to observe and rate children's interaction quality in preschools on the individual level is the *Individualized Classroom Assessment Scoring System* (inCLASS). The inCLASS, which was developed by US-American researchers, originally consists of three domains ("Teacher Interactions", "Peer Interactions", "Task Orientation"). Deviating from that, some international studies have identified a structure with the four domains "Positive Engagement with Teachers", "Positive Engagement with Peers",

"Positive Engagement with Tasks", and "Negative Classroom Management". However, country-specific differences with regard to educational (preschool)-systems may impair the transferability of such international results. This might be the case for the current situation in Austria as well, which is the focus of the present study. By using the inCLASS on a sample of 360 children from 90 preschools in Austria (Tyrol), the study aims to investigate the factor structure of the inCLASS with confirmatory factor analyses.

Individual children's interactions and their relation to home learning environment...

Presenting Author:Magdalena Riedmeier, University Koblenz-Landau, Germany; **Co-Author:**Katharina Kluczniok, Otto-Friedrich-University of Bamberg, Germany; **Co-Author:**Thilo Schmidt, Universität Koblenz-Landau, Germany

Numerous studies refer to the high importance of children's interaction processes in preschools and their quality for the children's development and educational success. It is also known that the quality of home learning environment (HLE) is particularly important for child development. However, most studies measure the quality of interactions at group level with the consequence that detailed knowledge on the quality of interactions at single child level is lacking. Particularly in the German context, there is a need for research to analyse the relation between children's interaction quality in preschool and the quality of HLE. This paper aims to address this desiderate by investigating HLE (e.g. home activities) on the basis of a parent interview and interaction quality on individual child level (n=241 children) in preschools in Germany using the relatively new and not yet widespread observational instrument *Individualized Classroom Assessment Scoring System* (inCLASS). Results from the child's first preschool year show for different HLE levels (e.g. low vs. high quality) no significant differences in the child's interaction quality. How far these findings prove to be stable must be investigated at the second measurement point, which is still in progress. It also remains to be seen whether any changes will occur at the child's second preschool year. Based on these findings implications for research, policy and practice are discussed.

Session K 5

14 August 2019 12:00 - 13:30

Lecture Hall - H09

Symposium

Instructional Design

History textbooks: constraints and affordances for historical thinking and multiperspectivity

Keywords: Citizenship education, Competencies, Content analysis, History, Mixed-method research, Teaching/instruction

Interest group: SIG 06 - Instructional Design, SIG 21 - Learning and Teaching in Culturally Diverse Settings, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Carla Van Boxtel, University of Amsterdam, Netherlands

Organiser: Carla Van Boxtel, University of Amsterdam, Netherlands

Discussant: Tsafir Goldberg, University of Haifa, Israel

History education plays an important role in empowering new generations to critically examine historical representations, to (re)interpret difficult pasts and enhance dialogue and mutual understanding. In this context, scholars in the field of history education advocate the teaching of historical thinking and reasoning, which departs from the understanding of history as interpretation and which includes the exploration of multiple perspectives. History textbooks have an important role in mediating the learning of history. History textbooks, however, often provide nationalist or essentialist perspectives on history and in the history classroom the teaching of historical thinking and reasoning is not common practice.

This symposium brings together research that provides more insight into how history textbooks and teachers' and students' use of textbooks constrain or afford multiperspectivity and historical thinking. The individual papers explore these topics in different contexts (The Netherlands, Austria, Syria). Based upon the findings of their studies, the presenters provide suggestions for teachers and teacher educators for writing and using history textbooks in ways that enhance the development of students' historical thinking abilities and contribute to open and democratic societies.

Narrative, metaphor and multiperspectivity in the history classroom. A case study

Presenting Author:Marc Kropman, University of Amsterdam, Netherlands; **Co-Author:**Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

A main goal of Dutch history education is learning to identify different perspectives and to contextualize these perspectives about the past. We investigated in a case study to what extent students are confronted with multiple perspectives in a two lesson unit about the Netherlands during World War II (WWII). All classroom materials (textbook, film clip, read aloud excerpt of a novel, workbook assignment) were analysed, as well as two videotaped lessons and the student results from a writing task. We analyzed both narratives and metaphors presented in the materials. The analysis shows that the narrative and accompanying metaphors of the Netherlands during WWII prevent looking at this subject in a multiperspectival way although the teacher brought to attention several other perspectives. Taken together, the classroom materials provide a more 'closed' narrative whereas the teacher supplied other perspectives.

Students' critical analysis of history textbook narratives about universal suffrage

Presenting Author:Annemiek Houwen, University of Amsterdam, Netherlands; **Co-Author:**Paul Holthuis, Rijksuniversiteit Groningen, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

Promoting historical thinking in the classroom is an important goal in history teaching. Historical thinking also includes the ability to critically examine historical representations. Although the narratives in history textbooks are historical interpretations, they are often not approached like that in the history classroom. Scholars in the field of history education have paid much attention to the critical analysis of primary sources, but less is known about the difficulties students experience when working with current representations of the past and about instructional approaches to support students in the ability to deconstruct such representations. In this study we investigated how students (n = 96) in upper secondary education critically analyzed texts from two different textbooks about the introduction of universal suffrage. Students were asked to indicate what the authors consider important, how they know, and what the differences and similarities between the texts are. Ten students were asked to perform the task thinking aloud. Results of the content-analysis showed that students came to understand that the texts presented different interpretations. Part of the students noticed differences on the level of historical representation, for example, more or less attention for historical context, causes and consequences and other perspectives. The approach that was adopted in the assignment, seems promising for the development of a pedagogy for the deconstruction of historical representations.

History textbooks and the construction of national identity in Syria

Presenting Author:Shaima Muhammad, University of Innsbruck, Austria

Research (Foster, 2012) shows that in many countries, textbooks continue to adopt a single nationalistic narrative of the past, where some perspectives are promoted, while others are ignored and silenced. Using critical discourse analysis, this study critically approaches the discourse on national identity in Syrian history textbooks. The research studies the 9th grade history textbook that is published by the Ministry of Education and the counterpart textbook that has been edited by an oppositional educational organization outside the country. The study problematizes the type of identity propagated in both textbooks and highlights the emancipatory potential of critical thinking and multiperspectivity in history education and the impact on the peace-building, transitional justice, and democratization of a country emerging from violence.

Implementing the paradigm shift to historical thinking in Austria. The crucial role of textbooks

Presenting Author:Roland Bernhard, University of Salzburg, Austria

In 2008, official reforms were made to the history curriculum in Austria, informed by a significant paradigm shift from a content orientation to a focus on historical thinking. In this talk, research from a mixed-methods project conducted in Austria from 2015-2018 will be presented. The main aims of this project were (1) to determine how the paradigm shift has reached the practice of teaching and the belief of teachers, and (2) how history textbooks are used in the practice and what role historical thinking plays in this context. A sequential mixed-methods research design was employed. The qualitative strand consisted of participant

observations in history lessons (n=50) and expert interviews with history teachers (n=50). In the quantitative strand, we administered questionnaires to teachers (n=277) and students (n=1,085). In this talk, mainly findings from the qualitative strand of the project will be presented. The data indicates that history textbooks are used extensively in history lessons as a source of positivistic knowledge. It also has become obvious that 10 years after its introduction, the historical thinking curriculum isn't understood by many Austrian history teachers and the domain-specific competencies of historical thinking are not well known. It will be argued that (1) the implementation of historical thinking into the teaching practice would be considerably supported by textbooks with a strong domain-specific historical thinking approach, and (2) that the constructive nature and limitations of textbooks should be dealt with in teacher education.

Session K 6

14 August 2019 12:00 - 13:30

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Teaching and Teacher Education

They believe happily ever after: Pre-service teachers' beliefs and reception of educational research

Keywords: Argumentation, Attitudes and beliefs, Conceptual change, Educational Psychology, Experimental studies, Higher education, Misconceptions, Pre-service teacher education, Reasoning, Synergies between learning teaching and research

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Johannes Bauer, University of Erfurt, Germany

Organiser: Eva Thomm, University of Erfurt, Germany

Organiser: Johannes Bauer, University of Erfurt, Germany

Discussant: Gavin Brown, University of Auckland, New Zealand

Research on evidence-based practice and the possibility of its implementation are hot topics in teacher education. According to policy calls, future teachers shall be equipped to inform and reflect their professional practice based on knowledge of educational research (Slavin, 2008; Wenglein et al., 2015). This implies valuing scientific evidence that is grounded in theory and derived by reliable methods as well as acquiring competencies to interpret and use it to inform one's practice (Kuhn & Park, 2005; Parr & Timperley, 2008). In contrast to these normative demands, however, teachers and pre-service teachers often seem to rely on common practices and everyday theories rather than on knowledge from systematic research (Hetmanek et al., 2015; Schildkamp & Kuiper, 2010). They cherish maladaptive beliefs and conceptions about educational issues that are quite resistant to change (e.g. Knight, 2015; Richardson, 1996). Such beliefs and reservations may interfere with pre-service teachers' retrieval, acceptance, and usage of research findings, and, thus, may hamper its incorporation in their future professional practice. To overcome this obstacle, and to foster favorable attitudes and capacities, it is informative to examine student teachers' beliefs and strategies when dealing with evidence of educational research. The symposium presents studies that examine the multifaceted nature of pre-service teachers' beliefs about educational topics and educational research, and the impact of such cognitions on processes of interpreting and retrieving scientific evidence. The contributions clarify potential reasons for reservations against educational research among pre-service teachers, examine misconceptions, and scrutinize preferences for and the use of scientific evidence.

Are pre-service teachers aware of their educational psychology misconceptions?

Presenting Author:Stephanie Pieschl, Technical University of Darmstadt, Germany; **Co-Author:**Janene Budd, University of Newcastle, Australia; **Co-**

Author:Jennifer Archer, The University of Newcastle, Australia

Laypeople are likely to have misconceptions in many domains of knowledge. Teachers' misconceptions are particularly problematic. If they harbour misconceptions about topics in educational psychology, this may negatively affect their teaching practices and thereby their students. Therefore, it is important to know the extent and kind of pre-service teachers' misconceptions and ways to address those effectively. During a compulsory undergraduate educational psychology course, a field study (N = 119) with a two-by-two within-subject design was implemented: Pre-service teachers filled in a misconceptions questionnaire at the start (T1) and the end (T2) of the course (factor: time). Half of the questionnaire topics were explicitly addressed during the course, while the other half were not explicitly addressed and served as a control condition (factor: content). For each topic, pre-service teachers had to decide which of two contrasting statements was "more true" and to rate their confidence in their decision. After each data collection, correct answers were discussed to increase awareness. We hypothesized that these awareness activities would reduce misconceptions and increase awareness of misconceptions. These hypotheses were confirmed. First, pre-service teachers had fewer misconceptions and more accurate confidence judgments at T2 than at T1. Second, their performance and confidence accuracy improved more for misconceptions addressed during the course than for misconceptions not addressed. However, it should be noted that pre-service teachers had numerous high-confidence misconceptions at T1 and still harboured some misconceptions at T2, even for misconceptions addressed during the course. Potential explanations and practical implications for teacher training will be discussed.

Questioning educational research: When evidence challenges pre-service teachers' prior beliefs

Presenting Author:Eva Thomm, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany; **Co-Author:**Bernadette Gold, University of Erfurt, Germany; **Co-Author:**Tilman Betsch, University of Erfurt, Germany

Teachers often have strong reservations against evidence from educational research, although it is vital to informed professional practice. One explanation may be that such evidence frequently contradicts prior beliefs or conventional wisdom. Facing belief-threatening scientific evidence, people tend to apply diverse strategies to discount the evidence rather than changing their beliefs. They resist belief-threatening evidence by also questioning the potency of science to study the phenomenon at all (Munro, 2010). The present study examines whether this "scientific impotence excuse" (SIE; Munro, 2010) applies to preservice teachers' reservations against evidence in educational research. A sample of N = 145 preservice teachers indicated their prior beliefs about an educational topic (i.e., effectiveness of grade retention) before and after reading either confirming or disconfirming scientific evidence. After reading, participants assessed their doubt on the potency of science to research the topic. Additionally, participants indicated their preference for scientific and non-scientific sources to inform themselves about the same as an indirect measure of discounting. Moderation analyses confirmed a significant interaction of prior belief and evidence read. Thus, when prior belief and scientific evidence about the educational topic conflicted, pre-service teachers tended to discount the general potency of educational research to examine this topic and demonstrated a lower preference for scientific sources to inform themselves about it. We will discuss the SIE as an approach to improve our understanding of how preservice teachers evaluate evidence from educational research.

Pre-service teachers' epistemic trust in educational scientists: A 'smart but evil' stereotype?

Presenting Author:Tom Rosman, Leibniz Institute for Psychology Information, Germany; **Co-Author:**Samuel Merk, University of Tübingen, Germany

In-service and pre-service teachers are increasingly required to integrate research results into their classroom practice. However, due to their limited methodological background knowledge, they often cannot evaluate scientific evidence firsthand. Instead, they are required to evaluate specific sources of information regarding their expertise, benevolence, and integrity. Using an experimental design, we investigated the amount of this so-called epistemic trustworthiness that pre-service teachers (N = 365) ascribe to the authors of texts presenting findings from educational research (e.g., learning with worked-out examples) that allegedly were written by either a practitioner, an expert, or a scientist. Results suggest that pre-service teachers view scientists as 'smart but evil' since they rate them as having substantially more expertise than practitioners, while also being less benevolent and lacking integrity. In a preregistered conceptual replication study, we will try to extend and replicate these findings; the results of this second study will, in addition to the data and results described here, be presented at the conference.

The instrumental quality of information sources for teaching: Pre-service teachers' beliefs

Presenting Author:Katharina Kiemer, Universität Augsburg, Germany; **Co-Author:**Ana Gatslerlia, University of Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

The question how to encourage pre-service teachers to rely more on scientific theories and evidence rather than on subjective theories when planning and reflecting on teaching (i.e. evidence-based teaching) has garnered attention in recent years (e.g. Slavin, 2008; Stark, 2017). Based on related research, we explore the effects of pre-service teachers' beliefs regarding the instrumental quality of different sources of *grounds/data* (Toulmin, 1958/2003), i.e. the extent to which they use scientific theories and evidence when reflecting about teaching situations. To do so, in a first step we developed an instrument to differentially assess beliefs on the instrumental quality of a) *scientific research*, b) *lay opinions* (subjective theories) and c) *anecdotal evidence* for teaching. Following that, we investigated differences between these sets of beliefs, as well as the predictive power of these beliefs for A) the selection of particular information sources (scientific theory, scientific study, opinion of a teacher, anecdotal evidence of a teacher) that were available to students while solving a problem case, and B) the use of these sources for the analysis of the case. Preliminary results indicate that most participants looked at two sources or fewer (60.7%) and only looked at each for about 99.78 seconds. Beliefs differed significantly between the different information sources, but did not significantly predict source selection. However, particularly participants' beliefs about the instrumental quality of subjective theories negatively predicted their use of information sources. We discuss our findings in light of recent research and think about implications for teacher education.

Session K 7

14 August 2019 12:00 - 13:30

Lecture Hall - H11

Symposium

Assessment and Evaluation

Learning by making comparative judgements? It's all about the mental effort!

Keywords: Assessment methods and tools, Competencies, Engineering, Higher education, Quantitative methods, Reflection, Secondary education, Technology, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Liesje Coertjens, Université catholique de Louvain (UCL), Belgium

Organiser: Tine van Daal, University of Antwerp, Belgium

Discussant: Anders Jonsson, Kristianstad University, Sweden

Recent evidence shows that comparative judgement (CJ) is a reliable and valid method for competence assessment. Assessors compare multiple pairs of student work (called representations) and indicate each time the better representation regarding the competence to be assessed. Pairwise comparison data are used to estimate quality scores (Pollitt, 2012). Studies suggest that CJ becomes easier over time. This indicates a learning effect. Yet, a theoretical framework underpinning learning by CJ is lacking. This symposium presents a theoretical framework that connects learning by making CJs to cognitive load and structural alignment (Figure 1). Mental load refers to comparison characteristics (e.g., length) that determine the amount of information an assessor should process (Liu & Li, 2012). Processing this information requires mental effort of an assessor, which impacts decision accuracy. The amount of mental effort required largely depends on the quality of assessors' mental schemas (i.e. expertise) (Sweller et al., 1998). However, while comparing and contrasting representations, assessors should identify commonalities/differences to structurally align both representations. This is identified as an important learning principle that enriches assessors' mental schemas (Gentner, 2010). Hence, learning by CJ can be conceptualized as enrichment of assessors' mental schemas through the process of structural alignment. The first presentation in this symposium examines to what extent the mental effort needed decreases over time. The other contributions focus on the learning process of comparing/contrasting itself within the context of (international) teacher learning (presentation 2) or student learning (presentation 3). The last presentation connects learning to aspects of mental load and effort.

Learning by making multiple comparative judgements: a longitudinal analysis of mental effort

Presenting Author: Tine van Daal, University of Antwerp, Belgium; **Co-Author:** Vincent Donche, University of Antwerp, Belgium; **Co-Author:** Sven De Maeyer, University of Antwerp, Belgium

Studies on comparative judgement (CJ) suggest that it becomes easier over time. This points to a potential learning effect of making multiple comparisons. This study initiates a theoretical framework to explain how making multiple comparisons may enhance learning and examines whether the mental effort that assessors need to invest in information processing decreases by making more CJs. 64 assessors compared three texts of 135 students to assess their argumentative writing competence. In total, 3031 comparisons were made. Judgement times were recorded per comparison and used as an indicator of mental effort. Mixed-effect modeling was used to model three hypotheses regarding the expected decrease in judgement time across comparisons: respectively, a linear, quadratic and cubic model were fitted. These three models are ranked to their relative fit (based on their AICc-values). Evidence for the cubic model as the best approximating model is overwhelming. Judgement time decreases per comparison, however, from about the 30th comparison on it slightly rises again. Assessors were found to differ in average judgement time as well in the strength of the decrease in invested time per comparison. Future research is necessary to systematically test the theoretical framework outlined, such as for example, studies looking at the relation of comparisons characteristics with mental effort or studies that relate mental effort to learning.

Unpacking teachers' assessment practices in STEM education across countries

Presenting Author: Eva Hartell, KTH Royal Institute of Technology, Sweden; **Co-Author:** Greg Strimel, Purdue University, United States; **Co-Author:** Scott Bartholomew, Purdue University, United States; **Co-Author:** Emily Yoshikawa-Ruesch, Purdue University, United States

The perceived demands of the future workforce continue to emphasize a need for enhanced Science, Technology, Engineering and Mathematics (STEM) education. An integral, but sometimes overlooked, part of the STEM-education paradigm is Technology and Engineering education (TEE). While TEE differs to some extent across the globe, a common feature is the use of open-ended design tasks as a pedagogical method, which has also become a preferred approach to teaching STEM concepts in an integrated manner. However, these open-ended design-tasks remain difficult to assess. Therefore, this paper will explore the potential of using comparative judgement (CJ) to unpack and explicate criteria for success in open-ended design tasks to better inform teachers' assessment practices in TEE across countries. Results revealed several interesting findings and provoking similarities and differences.

Learning by comparison: Effects of comparative judgment on feedback and performance in writing

Presenting Author: Renske Bouwer, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:** Marije Lesterhuis, University of Antwerp, Belgium; **Co-Author:** Pieterjan Bonne, Artevelde University College Ghent, Belgium; **Co-Author:** Sven De Maeyer, University of Antwerp, Belgium

In higher education, writing tasks are often accompanied by criteria indicating key aspects of writing quality. Sometimes, these criteria are also illustrated with examples of varying quality. It is, however, not yet clear how students learn from shared criteria and examples. This research aims to investigate the learning effects of two different instructional approaches in which students actively engage with examples: applying criteria or comparative judgment. International business students were instructed to write a five-paragraph essay, preceded by a 30-minutes peer assessment in which they evaluated the quality of a range of example essays. Half of the students evaluated the quality of the example essays using a list of teacher-designed criteria (criteria condition; $n = 20$), the other group evaluated by pairwise comparisons (comparative judgment condition; $n = 20$). Students were also requested to provide peer feedback. Results show that students in the comparative judgment condition provided relatively more feedback on higher order aspects of writing than students in the criteria condition. This was only the case for improvement feedback; for feedback on strengths there were no significant differences. Positive effects of comparative judgment on students' own writing performance were only moderate and non-significant in this small sample. Together, this study shows that comparative judgment can be as least as powerful as applying criteria to examples. Further research is needed on the long-term and indirect effects of comparative judgment, as it might influence students' conceptualization of writing quality without directly improving their writing performance.

The feasibility of CJ for assessing medical students' self-reflections

Presenting Author: Marije Lesterhuis, University of Antwerp, Belgium; **Co-Author:** Liesje Coertjens, Université catholique de Louvain (UCL), Belgium; **Co-Author:** Benedicte De Winter, University of Antwerp, Belgium; **Co-Author:** Maarten Goossens, University of Antwerp, Belgium; **Co-Author:** Sven De Maeyer,

University of Antwerp, Belgium; **Co-Author:**Nele Michels, University of Antwerp, Belgium

Medical practitioners' reflective skills are increasingly considered important and therefore included in the medical education curriculum. However, assessing students' reflective skills using rubrics does not appear to guarantee adequate inter-rater reliabilities. Recently, comparative judgement was introduced as a new method to evaluate performance assessments. The present study innovates in applying comparative judgement to assess students' written self-reflections and in investigating raters' views on the feasibility of the comparative judgement method. Twenty-two self-reflections, that had previously been assessed using rubrics, were assessed by a group of eight raters using comparative judgement. To examine raters' impressions of the feasibility of the comparative judgement method, a focus group was organized. The focus group was transcribed and analysed using an iterative procedure inspired by Braun and Clark's phases of thematic analysis. Raters reported that making comparisons made them focus more on the essential aspects in the self-reflections. Time investment was considered heavy, especially for the first comparisons. Yet, raters appreciated that they did not have to assign a grade to each self-reflection. Regarding the applicability of the comparative judgement method, raters mention that a downside of the method is that it does not automatically lead to a grade or feedback. More research is needed on how a student's place on the rank order and feedback from comparative judgement can be communicated to students.

Session K 8

14 August 2019 12:00 - 13:30

Lecture Hall - H08

Symposium

Higher Education, Instructional Design

Critical Thinking in Higher Education: Educational Guidelines and Instructional Interventions

Keywords: Attitudes and beliefs, Cognitive skills, Higher education, Instructional design, Interdisciplinary, Problem solving, Reasoning, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 06 - Instructional Design

Chairperson: Anita Heijltjes, Avans university of applied sciences, Netherlands

Organiser: Lara van Peppen, Erasmus University Rotterdam, Netherlands

Organiser: Eva Janssen, Utrecht University, Netherlands

Discussant: Patricia A. Alexander, University of Maryland, United States

Fostering students' critical thinking (CT) is a major ambition of higher education. Not only because CT-skills positively relate to learning outcomes, but also because a lack of CT-skills can result in erroneous decisions that may have serious consequences. However, there are many open questions regarding educational guidelines and effective instructional interventions for stimulating students' and teachers' CT. In this symposium, the chair will open with an interactive CT-exercise to let the audience personally experience the difficulty of CT. Thereafter, four contributions present research on CT in higher education from different perspectives. The first and second contribution share new insights into incorporating CT across the higher education curricula. The first contribution will elaborate on CT-skills and dispositions needed in different professional fields and educational practices in higher education institutes. The second contribution presents an educational protocol that specifies – at institutional, program, and course level – how higher education institutes can stimulate students' CT.

The third and fourth contribution present experimental studies on effectiveness of instructional interventions to foster teachers' and students' CT, focusing particularly on avoiding reasoning biases. The third contribution presents two experiments that aimed to gain insights in how to foster higher education teachers' CT-skills and their attitudes towards teaching it. The fourth contribution will elaborate on contrasting correct and erroneous examples as strategy for fostering higher education students' learning and transfer of CT-skills. Finally, our discussant – eminent educational psychologist and expert in domain-specific learning and (relational) reasoning – will engage the authors and audience in critical thinking about these studies.

Critical Thinking in Higher Education

Presenting Author:Aoife Ahern, University College Dublin, Ireland; **Co-Author:**Ciaran McNally, University College Dublin, Ireland; **Co-Author:**John O'Sullivan, University College Dublin, Ireland

This contribution describes the results of the European project CRITHEKEDU. This is a multidisciplinary project, looking at how Critical Thinking is defined, valued and taught in European Higher Education Institutions. The aim of the project is to improve understanding of CT and to make a contribution to improving the teaching of CT across a range of disciplines and countries. In this paper, the findings of two main research questions of this project will be discussed. The first looked at how employers value and define CT. An important part of this part of the project was to look at the opinions of employers from a range of disciplines and to assess the differences in those disciplines. The second focused on finding out what the status quo is in relation to how CT is taught in Europe. This involved 2 pieces of work: an extensive literature review of CT practices in Europe in a range of disciplines, and interviews with teachers in higher education, again from a range of disciplines, to find out their feelings on how CT is defined, valued, taught and supported.

Towards an 'Educational Protocol' for Stimulating Critical Thinking in Higher Education

Presenting Author:Jan Elen, KU Leuven, Belgium; **Co-Author:**Steven Huyghe, KU Leuven (BE), Belgium; **Co-Author:**Marleen Evers, KU Leuven (BE), Belgium; **Co-Author:**Lai Jiang, KU Leuven (BE), Belgium; **Co-Author:**An Verburg, University College Leuven Limburg, Belgium

Critical thinking is arguably the most important goal of higher education. No wonder that higher education institutions are eager to stimulate its development. That is, however, far from easy as there is no consensus with respect to the definition of CT, the assessment of critical thinking and the most optimal way to stimulate critical thinking. In analogy with medical protocols, an 'educational protocol on critical thinking' has been elaborated in the CRITHEKEDU-project. Starting from critical thinking as defined by Facione (1990), and considering the empirical and conceptual literature as well as systematic and practical experiences, the protocol specifies how Higher education institutions can stimulate critical thinking. The protocol specifies guidelines at the institutional level, at the program level and at the course level. By presenting them as a protocol, the guidelines are said to contain the best possible evidence to this date, the guidelines are explicit and said to be obligatory, and finally the guidelines are to be continuously discussed in view of improving them based on empirical evidence.

Training Higher Education Teachers to Identify Biases in Students' Critical Thinking

Presenting Author:Eva Janssen, Utrecht University, Netherlands; **Co-Author:**Tim Mainhard, Utrecht University, Netherlands; **Co-Author:**Anita Heijltjes, Avans University of Applied Sciences, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Lara van Peppen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Teaching critical thinking (CT) is a major ambition in higher education. We present two experiments that aimed to gain insight in how to equip higher education teachers for teaching CT, in particular the avoidance of bias in reasoning and decision-making. In Experiment 1 ($N = 54$), we investigated the effects of a three-session teacher training on CT. Results showed that instruction on common reasoning biases combined with the opportunity to practice the instructed principles with CT-tasks, had a large effect on teachers' performance on trained but not on novel CT-tasks, as compared to a no-treatment control condition. Furthermore, the training improved teachers' ability to detect biases in a student paper. However, although performing somewhat better than the control condition, trained teachers still had difficulties in correctly explaining those biases. From a teaching perspective this is a crucial shortcoming as being able to explain biases is necessary to provide adequate feedback on students' reasoning, which in turn is essential for students' CT-skills acquisition. Therefore, Experiment 2 ($N \approx 60$; data are collected in November 2018) aims to gain insight in how to further improve teachers' ability to explain students' reasoning biases. We will compare the effects of a CT-training that provides the same explicit instruction and task practice as offered in Experiment 1 with the effects of a CT-training that additionally provides teachers with strategies to explain students' reasoning biases in written student papers.

Can Contrasting Correct and Erroneous Examples Enhance Students' Critical Thinking Skills?

Presenting Author:Lara van Peppen, Erasmus University Rotterdam, Netherlands; **Co-Author:**Peter Verkoeijen, Erasmus University Rotterdam, Netherlands;

Co-Author:Anita Heijltjes, Avans University of Applied Sciences, Netherlands; **Co-Author:**Eva Janssen, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Fostering critical thinking is an important objective in higher education. However, little is known about effective teaching methods, especially regarding one important aspect of critical thinking: avoiding biased reasoning. Research has shown that explicit instruction combined with practice was effective for learning to avoid biased reasoning, and that practice consisting of worked-example study was more effective than problem solving. However, this was not sufficient to establish transfer to novel tasks. The present study investigated whether contrasting correct and erroneous examples in the practice phase – which has proven effective in other domains – would foster learning and transfer. 170 first-year students of a Dutch University of Applied Sciences received video-based instructions on the importance of critical thinking and on reasoning tasks, followed by (1) studying correct examples, (2) studying erroneous examples, (3) contrasting correct and erroneous examples, or (4) solving practice problems (control condition). Performance was measured on a pretest, immediate posttest, and delayed posttest (three weeks later), to examine effects on learning and transfer. Results revealed that learning improved after instruction and practice but there were no significant differences between the four practice conditions on either learning or transfer performance. This latter finding was not in line with our hypothesis that contrasting correct and erroneous examples would be more effective than the other practice activities and, moreover, does not replicate the finding of previous studies that practice consisting of worked example study is more effective than problem solving. The implications of these findings and directions for future research will be discussed.

Session K 9

14 August 2019 12:00 - 13:30

Seminar Room - S03

Symposium

Developmental Aspects of Instruction

New perspectives on playful learning in early STEM education

Keywords: Cognitive development, Early childhood education, Educational Psychology, Engineering, Learning approaches, Metacognition, Motivation, Problem solving, Quantitative methods, Science education, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Timo Reuter, University of Koblenz-Landau, Germany

Organiser: Timo Reuter, University of Koblenz-Landau, Germany

Discussant: Tessa van Schijndel, University of Amsterdam, Netherlands

Educational researchers widely agree that Science, Technology, Engineering and Mathematics (STEM) teaching can and should begin in early childhood. Yet there is debate about how to put this claim into practice. "Playful learning" provides opportunities for learning that do not come at the expense of play, and is linked to many positive child outcomes. This style of learning is characterized by an adult-prepared play-environment that allows children a high level of autonomy. Yet playful learning arrangements can differ in how much an adult scaffolds children. There is a lack of studies that systematically examine outcomes of playful learning, in relation to the level of adult scaffolding. The papers in this symposium help to fill this critical research gap in the area of STEM teaching, investigating children's abilities with varied adult scaffolding in playful activities.

Paper 1 reports effects of guided-play vs. free-block-play activities on children's balance concepts, focusing on verbal scaffolds. Paper 2 examines children's learning outcomes and problem-solving in the domain of gears, in a guided vs. free-play setting. Paper 3 looks at playful problem-solving with balance scales, asking how autonomy-supportive scaffolding can support children's self-regulated learning. Paper 4 investigates children's emerging engineering thinking and metacognition, during unsupported problem-solving in a construction play-like task.

These international perspectives on playful learning expand our understanding of how play, with different levels of adult scaffolding, can support children's development. Importantly, this work also helps to define the concept of "playful learning" for both researchers and practitioners in education.

Preschooler's Concepts and Problem Solving in the Domain of Gears in the Context of Guided Play

Presenting Author:Timo Reuter, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany

Developing 'Engineering habits of mind' (EHoM) (Lucas, Hanson & Claxton, 2014) is an important objective of early science education (National Research Council, 2012). Therefore, we developed and tested a guided-play-based learning environment for preschoolers in the domain of gears.

In two subsequent studies, we first investigated preschooler's current conceptions of turning-direction (TD) and turning-speed (TS) of meshed gears and compared it to older children's conceptions. Furthermore, we studied preschooler's EHoM in two construction-tasks (study 1). Second, we examined if we can enhance preschooler's conceptions and EHoM in a guided-play setting (study 2). Therefore, we conducted a 45-minute intervention in kindergartens using an experimental pre-posttest-design with a guided-play and a free-play-group.

Study 1 revealed rather low solution rates for TD and TS among preschoolers. However, solution rates improved with increasing age, indicating the potential to foster both conceptions via an intervention. Furthermore, analyses of the construction-tasks showed a great inter-individual range of EHoM incidences. Study 2 revealed an increase in the solution rates for TD and TS in the guided-play group, whereas solution rates remained stable in the free-play group. We still analyze effects on children's EHoM. However, the results indicate that even a 45-minute short guided-play intervention had an effect on preschooler's learning in the domain of gears.

Lucas, B., Hanson, J., & Claxton, G. (2014). *Thinking like an engineer. Implications for the education system* London: Royal Academy of Engineering.

National Research Council (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas* Washington: National Academies Press.

Preschoolers' Early Engineering Thinking and Metacognitive Capabilities during Constructional Task

Presenting Author:Taly Shechter, Da-Gan Center, Israel; **Co-Author:**Ornit Spektor-Levy, Bar-Ilan University, Israel

The study of developmental engineering thinking is gaining a growing interest. The Royal Academy of Engineering has recommended engaging in engineering education from childhood, specifying six Engineering Habits of Mind (EHoM): systems-thinking, problem-finding, visualizing, creative problem-solving, adapting, improving. However, few educational initiatives foster engineering thinking in young children, and few studies have been published. The aim of this study was to identify indications of early EHoM among young children during a problem-solving play-like task: Building a bridge with LEGO bricks. As part of an extended study encompassing 250 preschoolers (5–6 years of age), this paper presents preliminary results of 91 children. All participants and their problem-solving processes were video-recorded, and detailed analysis rubric was developed. The children were instructed to complete the task according to specific requirements (namely: to build a stable bridge of a certain height and length). Most of the children completed it successfully, particularly regarding the length of the bridge. They were able to identify various problems and to solve them, they could reflect on their constructional process and the product. Boys were more satisfied compared with girls, however, girls showed greater willingness to improve their construction. The data analysis also revealed competencies for metacognition and self-regulation like identifying errors and switching strategies, and pausing to think. Various correlations were found between metacognitive competencies and Engineering Habits of Mind. To conclude, the whole set of results found till now, show very young children's nascent engineering habits of mind and metacognitive capabilities.

Scaffolding to support autonomy promotes children's self-regulated learning

Presenting Author:Audrey Kittredge, Consultant, United States; **Co-Author:**Krishna Kulkarni, Faculty of Education, University of Cambridge, United Kingdom;

Co-Author:Natalie Day, Faculty of Education, University of Cambridge, United Kingdom; **Co-Author:**Sara Baker, Faculty of Education, United Kingdom

How can children become self-regulated learners at school, able to guide their own learning? Can adult scaffolding that supports children's autonomy promote such learning? We conducted an experimental study with 50 4-5 year-olds in 2 UK schools. Over 3 weeks, four teaching-experienced researchers engaged pairs of children in 3 sessions of playful problem-solving to balance toy scales. Children in an Autonomy condition received contingent scaffolding, in which researcher support increased or decreased relative to individual children's progress. Children were also encouraged to use self-regulated learning strategies ("stop and think", "see what's happening", "try something different") and autonomy-supportive language ("I did it all by myself!"). Children in an Efficiency condition worked with researchers who mimicked teachers in time-pressured classrooms: If the child needed help, researchers first offered minimal support, but then quickly solved the problem if the child did not progress. In a post-test, 88% of children in the Autonomy condition recalled autonomy-supportive language when teaching a puppet how to solve a balancing problem, and an impressive 20% spontaneously taught self-regulated learning strategies to the puppet. Children in the Autonomy condition also demonstrated a non-significant trend of persisting longer on an impossible task. These findings suggest that classroom-like, autonomy-supportive scaffolding during playful problem-solving helps young children internalize self-regulated learning strategies. This work extends experimental study of school-based scaffolding to early childhood, and is consistent with positive results of other short training programs. Moreover, the novel autonomy-supportive scaffolding framework presented here may help teachers to develop their classroom practice.

The effect of a guided play session on preschoolers' knowledge about balance

Presenting Author:Anke Maria Weber, University of Koblenz-Landau, Germany; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany

Young children have an intuitive understanding of science concepts such as balance. With increasing experience, they form theories on why objects can be balanced. This learning process can be supported through interventions combining children's experience and teachers' scaffolding, which may be understood as an aspect of playful learning. For playful learning to effect children's motivations and self-concepts, elements such as interactivity, adaptivity, and motivation-orientation should be present. In this study, the effect of playful learning, self-concept and motivation on children's balance concept is investigated.

184 preschoolers took part in a pre-post-follow-up-study with three groups. Experimental group 1 received an intervention with structured materials for guided block play with verbal scaffolds, experimental group 2 received the same intervention without the verbal scaffolds, and a control group played with blocks freely. Balance understanding was assessed with the Centre-of-Mass Test, and self-concept and motivation with an adaptation of the Y-CSM.

Growth curve analysis revealed an increase in understanding of balance for the scaffolding and the materials-only groups, with the scaffolding group outperforming the materials-only group after the intervention. Balance understanding increased with time, whereas self-concept and motivation had no effect on the development of the understanding of balance.

This results indicate that scaffolding boosts the effects of structured materials during a guided play session. Moreover, neither self-concept nor motivation moderated the development of the understanding of balance. A possible reason is young children's tendency to overestimate their abilities.

Session K 10

14 August 2019 12:00 - 13:30

Seminar Room - S05

Single Paper

Motivational, Social and Affective Processes

Motivation and Reading Comprehension

Keywords: Attitudes and beliefs, Comprehension of text and graphics, Experimental studies, Learning disabilities, Mixed-method research, Motivation, Motivation and emotion, Reading comprehension, Secondary education, Self-efficacy, Survey Research

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 08 - Motivation and Emotion

Chairperson: Ilse Hakvoort, Göteborg University, Sweden

The role of gender stereotypes in reading motivation: A study in high-school Chilean Students

Keywords: Attitudes and beliefs, Motivation, Reading comprehension, Survey Research

Presenting Author:Ana María Espinoza Catalán, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Katherine Strasser Salinas, Pontificia Universidad Católica de Chile, Chile

Two studies examined the role of gender and reading-related gender stereotypes for motivational factors associated with reading achievement. The first study used a between-subject randomized experiment to examine the effect of a character's gender on high-school students' judgement of their reading motivation and achievement. The second study used a correlational design to examine explicit gender stereotypes associated to reading achievement, behaviors, and beliefs, as well as male and female students' reading self-concept and motivation. Fifty-six high-school students in an urban school in Santiago de Chile participated. Analysis of variance showed the presence of gender-related stereotypes with regards to reading in both studies, in the sense that all students perceive reading to be more associated with females. Additionally, multivariate analysis of variance (MANCOVA) showed that after controlling for reading achievement, female students showed higher reading motivation. Multiple regression revealed a marginally significant interaction ($p=0.08$) between explicit gender stereotypes, gender, and reading motivation, such that stronger stereotypes are associated with higher reading motivation for females but lower reading motivation for males. These studies provide empirical evidence regarding a highly relevant topic in education -sources of inequalities in reading achievement- and which has not been deeply studied in the region. Findings could contribute to the creation of policies that promote equal literacy learning opportunities for male and female students in Latin America.

The relation between 9th grade students' reading motivation, reading behavior, and comprehension.

Keywords: Motivation, Reading comprehension, Secondary education, Self-efficacy

Presenting Author:Kim Van Ammel, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Koen Aesaert, Ghent University, Belgium

Research indicates that reading motivation is a central aspect in fostering reading comprehension. The relationship between reading comprehension and reading motivation can have important implications, especially during the adolescence, where the reading motivation of students tends to decline. The present study aims to analyze the relation among 9th grade students' reading motivation (i.e., both in the recreational and academic context), reading self-concept, reading behavior (i.e. engagement and frequency), and reading performance (i.e. comprehension). Participants included 2494 9th grade students from 195 classes in Flanders (Belgium). Both direct and indirect relations are taken into account, using structural equation modeling to analyze the relations. The model has been tested in a previous study among a group of 5th and 6th grade students. According to the results, student's reading motivation and their reading self-concept are independently related to their reading behavior and reading comprehension. Comparing the model analyzed among the group of 5th and 6th graders and the group of 9th graders, most results remain stable. However, there are some disparities.

Reading gains and social validity of personalized book reading intervention in secondary school.

Keywords: Learning disabilities, Mixed-method research, Motivation, Reading comprehension

Presenting Author:Suzanne Mol, Leiden University, Netherlands; **Co-Author:**Christine Espin, Leiden University, United States

The purpose of developing a personalized book reading intervention for secondary school students with reading difficulties was to not only improve their reading skills, but also foster their reading motivation. Specific attention was paid to selecting books of fiction that matched students' interests and reading level. The ten intervention sessions (1:1 with adult tutor) focused on improving the successful decoding and comprehension of passages in the selected book(s). Students also

completed a reading test at the start of each session to monitor their reading progress. At post-test, both students and instructors completed social validity questionnaires. Preliminary analyses show that tutors were satisfied with the book-selection procedure, the implementation of the intervention protocol, and their perceived students' progress. Next to student effects on reading, suggestions for further developing and evaluating the personalized program will be discussed.

Does comprehensibility influence the readers' intrinsic motivation during reading?

Keywords: Comprehension of text and graphics, Experimental studies, Motivation, Motivation and emotion

Presenting Author: Marcus Friedrich, Technical University of Braunschweig, Germany; **Co-Author:** Elke Heise, Institut für Pädagogische Psychologie, TU Braunschweig, Germany

Based on Kintsch and van Dijk's (1978) notion of comprehensibility, the fluency theory (Reber, Schwarz & Winkelman, 2004) and the self-determination theory (Ryan & Deci, 2000), this study tested the following assumptions: The more comprehensible a text is, the greater are the readers' perceived competence, their self-efficacy beliefs regarding the text, their intrinsic motivation during reading, their interest in the topic of the text, and their actual text comprehension. These assumptions were tested in a between-subjects design experiment with 302 university students. Participants completed pre-test questionnaires regarding interest, self-efficacy beliefs and prior-knowledge concerning the topic "measures of central tendency". Participants then read one of 15 randomly assigned texts on measures of central tendency from different introductory statistics books and subsequently answered post-test questionnaires regarding comprehensibility, perceived competence, intrinsic motivation during reading, interest and self-efficacy beliefs regarding "measures of central tendency" as well as a comprehension test on this topic. As expected, ANCOVAs with planned comparisons showed statistically significant effects of the texts' mean comprehensibility on perceived competence (partial $\eta^2 = .04$), self-efficacy beliefs (partial $\eta^2 = .09$), intrinsic motivation (partial $\eta^2 = .12$), interest in the topic (partial $\eta^2 = .07$) and actual text comprehension (partial $\eta^2 = .12$). These results are in line with prior research and a preliminary study with two texts and 105 university students. A replication study with pupils is currently being prepared. Overall the results once again point to the importance of comprehensibility of textbooks.

Session K 11

14 August 2019 12:00 - 13:30

Seminar Room - S13

Single Paper

Instructional Design, Teaching and Teacher Education

Reflection

Keywords: Attitudes and beliefs, Cooperative/collaborative learning, Educational Psychology, Inquiry learning, Pre-service teacher education, Professions and applied sciences, Qualitative methods, Reflection, Science education, Survey Research, Teacher professional development

Interest group: SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education

Chairperson: Katja Scharenberg, University of Education Freiburg, Germany

Cultivation of science process skills by promoting effective collaboration and reflection

Keywords: Cooperative/collaborative learning, Educational Psychology, Reflection, Science education

Presenting Author: Yuri Uesaka, The University of Tokyo, Japan; **Co-Author:** Satomi Shiba, University of Tokyo, Japan; **Co-Author:** Etsuko Tanaka, Nagoya University, Japan

In science education, students need to develop 'science process skills', defined as 'the adaptation of the skills used by scientists for composing knowledge, thinking of problems and making conclusions' (Karsli, Yaman, & Ayas, 2010). The current study focused on the skills of students necessary when they plan and conduct experiments and reflect on the results. Understanding and applying a concept of 'condition control' was the main learning goal in the proposed class. To achieve this goal, the proposed class integrated the explicit instruction of critical science skills in each process of science experiment and opportunity for students to apply their learning to proceed in a science experiment as a group in class. Also, effective collaboration and reflection were supported to promote students' learning. Authors held a special summer programme for 62 junior high school students and provided science classes for 5 days. Participants were allocated into 3 groups: control (Cont), collaboration-supported (C-Supp) and both the collaboration and reflection-supported (C&R-Supp). In the pre-test and post-test, students' science process skills were evaluated by two tasks: a free description of key points of conducting science experiments, and an experiment planning test in different context. For the scores of description of key points of the science experiment, results show that C&R-Supp significantly improved compared to Cont and S-Supp group. Regarding the score of experiment planning test, there was no significant difference among different groups. However, significant improvements from pre-test to post-test were shown.

Professional identities of English literature teachers in South Africa

Keywords: Attitudes and beliefs, Qualitative methods, Reflection, Teacher professional development

Presenting Author: Salome Romylos, North-West University, South Africa

Research in teacher knowledge mostly focuses on the 'what' and 'how' questions. In other words, 'what' teachers need to know and 'how' they should teach to effect successful learning. This over-emphasis on PCK, although critically important, may result in the neglect of the teacher – the 'who' in teaching. Data for this research were drawn from five teacher participants who teach English First Additional Language (EFAL) in the FET (Further Education and Training) phase (Grade 10-12). Two research questions informed this study, namely: What is the nature of the professional identities of participants? and To what extent (if at all) do teacher professional identities influence the choices of teachers' practice? Four themes emerged from the data which were collected via interviews, class observations and document analysis. These were: perceptions about becoming and being an English teacher; beliefs about English as subject; influences on the professional identities of teachers and beliefs teachers have about their selves and their classrooms as pedagogical spaces. These four main themes yielded many sub-themes which contributed in compiling a composite image of the professional identities of participants.

Dialogic tensions in pre-service subject teachers' identity negotiations

Keywords: Inquiry learning, Pre-service teacher education, Qualitative methods, Reflection

Presenting Author: Maarit Arvaja, University of Jyväskylä, Finland; **Co-Author:** Anneli Sarja, University of Jyväskylä, Finland

This study explores how five pre-service subject teachers from different disciplines made sense of and characterized their teacher identity after completing their yearlong pedagogical studies. Leaning on the Bakhtinian dialogical approach and socio-culturally oriented discourse analysis, we examine how the students negotiated multiple voices in their narratives (interviews) and how they positioned themselves in relation to these voices, thereby creating their own voice as a teacher. In the students' identity negotiation the Discourse based on participatory pedagogy and educator responsibility, which emphasizes pupils' and teachers' authorship, contradicted with the Discourse of traditional pedagogy that the students had as a cultural resource from their own youth. These different Discourses - representing different voices and space-time contexts and pedagogical arrangements - collided with each other and were tested and reflected in an internal dialogue and also in practice. By this process the students eventually acquired their own voice as a teacher.

Teachers' occupational attributes and their psychological wellbeing and job satisfaction

Keywords: Educational Psychology, Professions and applied sciences, Survey Research, Teacher professional development

Presenting Author: Hanke Korpershoek, University of Groningen, Netherlands; **Co-Author:** Dennis McInerney, The Australian Catholic University, Australia; **Co-Author:** Hui Wang, McGill University, Montreal, Canada; **Co-Author:** Alexandre Morin, Concordia University, Montreal, Canada

The teaching profession is generally seen and experienced as demanding and stressful, though little is known about the determinants of teachers' psychological wellbeing, job satisfaction, occupational self-concept and quitting intentions. In this paper, teachers' occupational attributes (i.e. professional and personal characteristics) were investigated as determinants. Henceforth, the Educator Motivation and Attribute Profile (EdMAP) scales were used to describe the nature of 1,109 Hong Kong primary and secondary school teachers' occupational attributes. Furthermore, the relationships with the teacher outcomes were investigated. Construct validity and reliabilities of the EdMAP scales were satisfactory. The results showed positive associations between teachers' occupational attributes

and their wellbeing, job satisfaction, and self-concept, and negative associations with quitting intentions. Henceforth, the EdMAP can be used to identify those adaptive factors that could increase teachers' wellbeing, job satisfaction and occupational self-concept and reduce quitting intentions.

Session K 12

14 August 2019 12:00 - 13:30

Seminar Room - S12

Single Paper

Assessment and Evaluation, Cognitive Science, Learning and Social Interaction

Inquiry Learning in Primary Education

Keywords: Cognitive skills, Collaborative Learning, Communities of learners, E-learning/ Online learning, Inquiry learning, Out-of-school learning, Primary education, Reasoning, Science education

Interest group: SIG 20 - Inquiry Learning

Chairperson: Denis Francesconi, Denmark

New approaches to Philosophy with Children: two methods for developing Community of Inquiry practice

Keywords: Collaborative Learning, Communities of learners, Inquiry learning, Primary education

Presenting Author: Laura Kerslake, University of Cambridge, United Kingdom; **Presenting Author:** Enrico Postiglione, University of Modena & Reggio Emilia, Italy

Philosophy with Children (PwC) aims to develop children's critical attitude, individual expression and mutual co-operation, using a Community of Inquiry (CoI) pedagogical model. While the authors find the overall aims of PwC to be important in terms of engagement with school curricula and for future citizenship, we have also identified some issues with current techniques. Previous research has raised questions about the accessibility to the CoI for all participants regardless of background, and also barriers to the uptake of PwC caused by teacher training limitation. This paper presents two new approaches to PwC developed by each of the authors: the Playground of Ideas (PoI) and the Single-Word Response method (SWRm), the techniques of which are further detailed in the paper. The aim of each is to redress the issues previously identified. Findings from a study into the SWRm approach indicates enhanced participant inclusion, reducing the divide between participants in heterogeneous groups, while data from the PoI study indicate that it can be used by non-specialist teachers to carry out inquiry learning, and also that there is a positive impact on teachers' practice and classroom discussion culture.

Understanding Causal Relationships at Primary School

Keywords: Cognitive skills, Inquiry learning, Primary education, Reasoning

Presenting Author: Calliste Scheibling, Paris 8 University, France; **Co-Author:** Elena Pasquinelli, Foundation La main à la pâte, France; **Co-Author:** Emmanuel Sander, University of Geneva, Switzerland

Inquiry reasoning and critical thinking are intensively linked (Bailin, 2002). Indeed, to adopt inquiry reasoning, it needs both to be open to new evidence, to find alternative explanations, or to solve problems for example. However, we observe that students have difficulties to develop inquiry reasoning and mainly to transfer it to new domains (Bransford, 2010). In our study, we focused on one specific skill required to develop inquiry reasoning: understanding causal relationship. Due to cognitive bias and intuitive conceptions students have difficulty to establish causal relationship: understanding interaction, coincidence, hidden cause, and so on. We make the hypothesis that these difficulties come from a lack of recategorization, which means the ability to reinterpret the situation in order to add new features and adopt a new representation (Hofstadter & Sander, 2013). We conducted an intervention during school year with students at primary school (4th & 5th grades) to test a teaching method based on this mechanism of multiple categorization to develop understanding of causal relationship at primary school. The experimental group (N=256) followed 12 sciences sessions based on this recategorization principle. It showed better results at the post-test to understand spurious correlations and interactions compared to the control group (N=257). Educational implications will be discussed.

What happens during Scaling up? Promoting Primary School Children's Inquiry Learning

Keywords: Inquiry learning, Out-of-school learning, Primary education, Science education

Presenting Author: Julia Schiefer, University of Tuebingen, Germany; **Co-Author:** Jessika Golle, University of Tuebingen, Germany; **Co-Author:** Ulrich Trautwein, University of Tübingen, Germany

The fostering of an adequate understanding of science is a normative goal of science education, already at the primary school level. Thus, in prior research, a corresponding 10-week science intervention was developed and successfully evaluated with an efficacy and an effectiveness study. The intervention is aimed at enhancing children's understanding of science (e.g., inquiry-related competencies and epistemic beliefs in the domain of science), as well as motivational dispositions. In the present study, we examined the impact of this intervention after it has been scaled up at 30 local sites of an extracurricular STEM enrichment program. We applied a multisite cluster randomized controlled trial with repeated measures. Thirty course instructors and 310 third- and fourth-grade students participated. Children in the intervention showed better inquiry-related competencies and more sophisticated epistemic beliefs than children in the control group. Regarding the development of epistemic beliefs, girls benefitted more from the intervention than boys. Overall, the results point to a successful scaling up of the intervention under real-life conditions.

Intervention on Sixth Graders Online Inquiry Skills in Science

Keywords: E-learning/ Online learning, Inquiry learning, Primary education, Science education

Presenting Author: Norbert Erdmann, University of Turku, Finland; **Co-Author:** Mirjamajja Mikkilä-Erdmann, University of Turku, Finland; **Co-Author:** Eero Sormunen, University of Tampere, Finland; **Co-Author:** Marja Vauras, University of Turku, Finland

The internet and, hence, online inquiry skills play a central role in students' school lives, even at the primary school level. In science, students are expected to search for information and find relevant sources from the Internet, and to use multiple sources for synthesis writing. However, these skills are not taught systematically in schools. A six-week quasi-experimental pretest-posttest intervention was delivered to enhance students' online inquiry skills, using the scientific topic of energy. The intervention was conducted at 10 local primary schools with 248 sixth graders. The pre- and posttests were conducted using a performance-oriented application called NEURONE which provided the students with a customized Internet environment. The students were asked to search for three relevant sources and write a synthesis. The study found that the intervention supported students' online inquiry skills in science, particularly in synthesis writing.

Session K 13

14 August 2019 12:00 - 13:30

Seminar Room - S07

Single Paper

Educational Policy and Systems, Learning and Instructional Technology

Mixed-method Research in Learning Technologies

Keywords: Early childhood education, Educational technology, Instructional design, Language (L1/Standard Language), Learning approaches, Learning Technologies, Mixed-method research, Neuroscience, Reflection, Self-regulation, Video analysis

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 27 - Online Measures of Learning Processes

Chairperson: Esther Kaufmann, University of Education Zurich / University of Zurich, Switzerland

The use of the « Lantern » tool to promote self-regulation learning and classroom management

Keywords: Educational technology, Learning approaches, Learning Technologies, Mixed-method research

Presenting Author:Sheila Padiglia, HEP-BEJUNE, Switzerland; **Co-Author:**Stéphanie Boéchat-Heer, HEP-BEJUNE, Switzerland; **Co-Author:**Céline Miserez-Caperos, HEP-BEJUNE, University of teacher education, Switzerland

The aim of this paper is to present the results of the evaluation of the introduction of a new tool (Lantern) in two classrooms of a primary school. More specifically, we observed possible changes in classroom management and student's self-regulation. We opted for the use of mixed methods, including interviews with teachers at the beginning and at the end of the project, observations within the classroom (videorecorded) during the school year (4 sessions in two classrooms) and questionnaires with students. The results show that the use of the "Lantern" tool makes it possible to promote the students' self-regulation and the teacher's management of the classroom. These results highlight the potential tool's contributions in terms of educational value and stimulate reflection on a possible generalization in the classrooms.

Self-regulated learning skills matter in dashboard sense-making

Keywords: Learning Technologies, Mixed-method research, Reflection, Self-regulation

Presenting Author:Ioana Jivet, Open University of the Netherlands, Netherlands; **Co-Author:**Maren Scheffel, Open University of the Netherlands, Netherlands; **Co-Author:**Marcel Schmitz, Zuyd University of Applied Sciences, Netherlands; **Co-Author:**Marcus Specht, Open University of the Netherlands, Netherlands; **Co-Author:**Hendrik Drachler, Goethe University Frankfurt, Germany

Learning analytics dashboard are tools developed to support awareness and reflection and aid learners in their learning process. However, we know little about how students make sense of the information presented on learner dashboards and what influences this process or its outcomes. In this research, we investigated whether learner goals and learners' self-regulated learning skills have an effect on what dashboard design elements students find relevant for interpreting dashboards and deciding on next steps. We followed a two-step research design with an initial qualitative pre-study to gain initial insights into the research topic, followed by an extensive quantitative study with 179 university students at a Dutch university of applied sciences. We uncovered two underlying constructs for sense-making: transparency of design and support for action. Statistical analyses showed that SRL skills are predictors for how relevant students find these two constructs, but assigned learner goals, i.e., mastering a topic (being effective) or mastering a course (being efficient), did not have any significant effect on the perceived relevance of dashboard elements. With these findings, we can design more inclusive and flexible designs that will cater to the needs of both novice and expert SRL learners.

Dialect and Standard Language in Kindergarten

Keywords: Early childhood education, Language (L1/Standard Language), Mixed-method research, Video analysis

Presenting Author:Johanna Quiring, St.Gallen University of Teacher Education, Switzerland; **Presenting Author:**Franziska Vogt, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Martina Zumtobel, Pädagogische Hochschule Vorarlberg, Austria; **Co-Author:**Cordula Löffler, University of Education Weingarten, Germany

In Switzerland there is a political controversy whether teachers in kindergarten should use dialect or standard German. The discussion in the media evolves around arguments concerning the integration of children with German as a second language and cultivating a national identity through language use (Knoll 2018). Furthermore, it is debated whether the familiarization with standard German in kindergarten supports early literacy, as standard German is used for writing. Policies vary ranging from "only dialect" to "dialect and standard German equally" as well as "no official policy". This study focuses on the actual practices of kindergarten teachers in their respective policy contexts. Quantitative analysis of video-protocols show that mostly dialect is used in kindergartens and that there seems to be no difference in dialect use between areas with different policies. Preliminary findings of the qualitative analysis indicate that there is no common understanding on the use of dialect and standard language among kindergarten teachers. Further research is needed to understand how the use of dialect and standard German in kindergarten is affecting children's learning outcomes, specifically literacy outcomes and the competencies of second language learners.

Using Eye-tracking and EEG to investigate the Redundancy Principle in Virtual Reality

Keywords: Educational technology, Instructional design, Mixed-method research, Neuroscience

Presenting Author:Sarune Baceviciute, University of Copenhagen, Denmark; **Co-Author:**Thomas Terkildsen, University of Copenhagen, Denmark; **Co-Author:**Guido Makransky, University of Copenhagen, Denmark

Utilizing advanced psychophysiological approaches, learning measures and psycho-metric scales, this experiment explores how the redundancy-principle generalizes to instructional learning in highly immersive media. In order to investigate this, 75 participants were subjected to a specifically-designed educational immersive Virtual Reality (VR) application in 3 versions, each delivering learning content to the learner in a distinct representation format: (1) visual representation format, (2) auditory presentation format, and (3) a redundancy (i.e. both visual and auditory) format. To further explore how varying task difficulty might influence cognitive processing within these three formats, learning information within the conditions was additionally manipulated to alternate between being low and high in reading difficulty. Findings suggest important implications to the design of learning content for VR environments and demonstrate the significance of objective measures of learning in an educational context.

Session K 14

14 August 2019 12:00 - 13:30

Seminar Room - S09

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools in Higher Education

Keywords: Assessment methods and tools, Content analysis, Higher education, Inquiry learning, Problem solving, Psychometrics, Quantitative methods, Science education, Self-regulation, Social interaction

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Esther Adi-Japha, Bar-Ilan University, Israel

An investigation of students' actions in response to written feedback in a science course

Keywords: Assessment methods and tools, Higher education, Inquiry learning, Science education

Presenting Author:Costas Constantinou, University of Cyprus, Cyprus; **Co-Author:**Elena Siakidou, University of Cyprus, Cyprus; **Co-Author:**Evangelia Irakleous, University of Cyprus, Cyprus; **Co-Author:**Olia Tsvitanidou, University of Cyprus, Cyprus

AbstractWe report on an exploratory study that focuses on a specific form of feedback, namely written feedback provided by the teacher to the students. The study aimed to investigate how pre-service teachers engage with the process of interpreting, and acting on, the feedback. This study is situated in the context of an undergraduate science-content course, which is compulsory for students pursuing a degree in Primary Education. The data collection process relied on the following procedure: a) students worked in small groups of three to four, to respond to open-ended conceptual tasks (CT) at various times in the Teaching Learning Sequence (TLS), throughout an entire semester, b) students' responses were collected, coded and returned to the students with structured feedback comments, c) students were asked to discuss the feedback comments they received on their own work and act on it to revise their initial response within their group. Students' group discussions while processing the feedback comments were video-recorded (main data source). Initial and revised responses to the conceptual tasks and follow-up interviews served as additional data sources. Qualitative analysis is still in progress. This research study is expected to contribute towards enriching the existing knowledge regarding the use of feedback by the students and offer important insights for teacher feedback and also for the design of teaching/learning sequences purporting to incorporate formative assessment.

Validity and Resource Affordances in Examinations: A Theoretical and Methodological Framework

Keywords: Assessment methods and tools, Higher education, Psychometrics, Social interaction

Presenting Author: Tobias Halbherr, Swiss Federal Institute of Technology Zurich / ETH Zurich, Switzerland

Most examinations take place under resource-poor conditions, usually limited to a pen, an empty piece of paper, and a task sheet. In contrast, when students leave university to apply what they have learnt as professionals, they will have available a wide array of potential tools, easy access to information, and tackle tasks collaboratively with support from networks of experts and peers. Resource-poor examination practices in (higher) education are far removed from the corresponding resource-rich disciplinary practices in which they intend to assess competencies. If we intend to assess student competencies in resource-rich disciplinary practices, does validity depend on correspondingly resource-rich examinations or do conventional resource-poor ones suffice? This paper presents a theoretical and methodological framework for validating resource-rich versus corresponding resource-poor examinations in the context of a given course, its learning objectives, and corresponding disciplinary practices. The theoretical framework contrasts conventional mindbound models of cognition with situated conceptions of cognition, which regard cognition as indissociable from the situated interaction of the cognitive agent with his/her environment. This contrast leads to a set of validity arguments, which in turn inform corresponding validation study designs for comparing resource-rich versus resource-poor examination implementations.

Undergraduates' and graduates' critical thinking skills in a performance assessment

Keywords: Assessment methods and tools, Higher education, Problem solving, Quantitative methods

Presenting Author: Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; **Co-Author:** Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:** Susanne Schmidt, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:** Richard Shavelson, Stanford University, United States; **Co-Author:** Klaus Beck, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:** Dimitri Molerov, Humboldt-University Berlin, Germany; **Co-Author:** Jana Jurisch, Johannes Gutenberg-Universität Mainz, Germany

The ability to make elaborated and critical decisions based on valid and reliable information is becoming an increasingly important 21st century skill. In this study, criterion-sampling measurement is presented as an approach for validly assessing these complex, multifaceted skills. For this purpose, performance assessments (PA) are developed using "criterion" tasks drawn from real-world decision-making situations across academic domains. One PA, designed to measure critical thinking, where students are asked to make a well-founded decision about the construction of wind turbines in a small town, has been validated in our study. The PA is computer-based and the test performance was scored using a theoretically developed anchored rating scheme. Performance scores were constructed as the average of two trained raters' ratings. Additionally, we gathered data on how the quantity and quality of the 22 documents presented in the PA were evaluated, and examined the participants' ability to judge information source quality in terms of its reliability and relevance. On average, the participants ($N=55$ students from a German university) scored 83 out of a maximum of 138 points, their results ranging between 32 and 117 points. A significant correlation was found between the correct judgements of relevance and validity and task performance in the scoring dimension "Recognizing and evaluating consequences of decision-making and actions". The first results indicate that there are large differences between students with regard to their ability to correctly assess information, whereby both undergraduates and graduates show considerable deficits at the end of their studies.

What's the point: Do annotations on students' work promote self-regulation?

Keywords: Assessment methods and tools, Content analysis, Quantitative methods, Self-regulation

Presenting Author: Cathrine Derham, University of Surrey, United Kingdom; **Presenting Author:** Kieran Balloo, University of Surrey, United Kingdom;

Presenting Author: Naomi Winstone, University of Surrey, United Kingdom; **Co-Author:** Maria Norman, University of Surrey, United Kingdom

As one component of the feedback process, annotations on student work should focus upon providing explanations and guidance, which encourage students to use the comments to develop their abilities to act as self-regulated learners; thus promoting what Carless (2015) refers to as the new paradigm of feedback practices. This is contrary to the old paradigm in which annotations merely serve to transfer information, characterised by evaluative statements and corrective advice. It is argued that it is not only the content of the message, but also the language used, which has an impact upon the sustainability of this form of feedback practice. The current study reports on an analysis of annotations in the form of 1760 in-text comments added by markers to 52 summative essays. Findings indicated that the majority of comments were directed at the level of task performance rather than relating to the process (i.e. giving students advice about their future work and regulation of their actions). Additionally, there were positive correlations found between grades and words expressing a positive emotional tone, as well as negative correlations between grades and words which had connotations of sadness, risk and were phrased as questions. It appears that all annotations encourage the old paradigm as they focus upon the delivery of information, which minimises the potential upon student learning. It is argued that markers' practices could be modified to incorporate appropriate language and direction which could have a more positive impact upon students learning, maximising the benefit of in-text comments

Session K 15

14 August 2019 12:00 - 13:30

Seminar Room - S14

Single Paper

Assessment and Evaluation, Learning and Instructional Technology

Assessment Methods and Tools

Keywords: Assessment methods and tools, Collaborative Learning, Conceptual change, Cooperative/collaborative learning, E-learning/ Online learning, Higher education, Instructional design, Interdisciplinary, Lifelong learning, Problem-based learning

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Julia Hein, University of Mannheim, Germany

Alternative assessment: Toward Advancing Future Skills [ASSET: Erasmus+ co-funded project]

Keywords: Assessment methods and tools, Higher education, Instructional design, Lifelong learning

Presenting Author: Dorit Alt, Kinneret College on the Sea of Galilee, Israel; **Co-Author:** Nirit Raichel, Kinneret College on the Sea of Galilee, Israel

This study sought to delineate the implementation of Problem-Based Learning (PBL) in a teacher training program and peer- and self- assessment. The research was done within the framework ASSET: Erasmus+ co-funded project. This intervention was accompanied by measuring the participants' perceptions of the problem-based learning environment and the assessment methods used compared with those of other courses they were previously enrolled in. Another aim was to reveal the most effective perceived PBL constructivist activities in enhancing the assessment methods. Data were gathered from 61 second-year students in a M.Ed. study track at a teacher training college located in Northern Israel enrolled in a course on the education policy in Israel by the *Constructivist Learning in Higher Education Settings Questionnaire (CLHES)*, and the *Peer- and Self- Assessment Questionnaire*. The results showed that the PBL related activities were more pronounced in the designed intervention than in previous courses the students were enrolled in. Large effect size results were found for the perceptions of the *peer- and self- assessment* factors. *Social interaction* was found connected to the *peer assessment* variable; whereas *Cooperative dialogue* was related to the *self-assessment* construct. Implications, limitations, and suggestions for future studies are discussed.

Feedback metaphors in online learning environments

Keywords: Assessment methods and tools, Conceptual change, E-learning/ Online learning, Higher education

Presenting Author: Lasse Jensen, University of Copenhagen, Denmark; **Co-Author:** Margaret Bearman, Deakin University, Australia; **Co-Author:** David Boud, University of Technology Sydney/ Deakin University, Australia

This paper investigates the conceptual metaphors that are shaping our understandings of feedback and feedback practice in online learning environments.

Through an analysis of the different conceptualizations of feedback found in current educational research, this paper identifies two distinct conceptual metaphors that underlie much of our thinking and writing about what feedback is, what purpose it serves, and what good feedback practice looks like. We refer to these two metaphors as *feedback is a signpost* and *feedback is a review*. The signpost metaphor considers the learning process to be a journey and understands feedback as the directions you get to help you find your way. In this view feedback is corrective, often automatized, and typically prompted by the student's interactions with the online learning system. According to the review metaphor, feedback is given as a qualitative judgement about student work with the aim of helping the student improve their performance. An analysis of the two metaphors leads to a discussion of the significance and entailments of each, and how they lay out different understandings of not only feedback itself but also of online teaching and learning.

A systematic review of methods for the assessment of collaborative learning in higher education

Keywords: Assessment methods and tools, Cooperative/collaborative learning, Higher education, Problem-based learning

Presenting Author:Hajo Meijer, University of Groningen, Netherlands; **Co-Author:**Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Rink Hoekstra, University of Groningen, Netherlands; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands

Collaborative learning is regularly used in higher education and can lead to higher learning outcomes and the development of soft-skills. However, since students can differ in terms of, for example, cognitive capacity and motivation, problems may arise with the assessment of collaborative learning. Although teachers clearly express that they experience problems with the assessment of collaborative learning and want to learn more about it, research on the assessment of collaborative learning is scarce. Therefore, the current study systematically reviewed the literature on methods and instruments that teachers can use for the assessment of collaborative learning. More specifically, it generated an overview of (a) general characteristics and (b) psychometric characteristics of methods and instruments available for the assessment of collaborative learning. This overview will enable teachers to make informed decisions about the methods and instruments they want to use for the assessment of collaborative learning and will inform research on the strengths and weaknesses of the (literature on) methods and instruments for the assessment of collaborative learning.

The state of the art of interprofessional assessment in undergraduate health and social education.

Keywords: Assessment methods and tools, Collaborative Learning, Higher education, Interdisciplinary

Presenting Author:Hester Smeets, Zuyd University of Applied Sciences & Maastricht University, Netherlands; **Co-Author:**Dominique Sluijsmans, Zuyd University of Applied Sciences, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands; **Co-Author:**Albine Moser, Zuyd University of Applied Sciences, Netherlands

There is agreement on the need for interprofessional education of future health professionals. Regarding the assessment design in interprofessional education, there should be alignment between the goals of the assessment (competencies, tasks), the assessment activities (assessment tools) and the assessment roles (pool of assessors). However, not all interprofessional education programmes involve assessment and when assessment is implemented, researchers express the lack of an aligned programme for interprofessional assessment. A scoping review was conducted to examine the state of the art of interprofessional assessment. The aim of this scoping review was to gain insights in interprofessional assessment used in undergraduate health and social education regarding what to assess, who assesses, how to assess, and underlying assessment theories. We included 37 publications. 'What is assessed' mainly entailed the competencies as known from national interprofessional competency frameworks. Information about the assessors showed that the background of the assessors differed (e.g. professionals, peers or patients). Most used assessment tools were rubrics, checklist or rating scales. Less than half of the publications described a theory. In only ten studies, all aspects of an interprofessional assessment program were addressed. The alignment between these aspects, however, is weak. We can conclude that little is known about an aligned interprofessional assessment programme. Future research focusses on the development and design of an aligned assessment program for assessing interprofessional competencies.

Session K 16

14 August 2019 12:00 - 13:30

Seminar Room - S11

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Teacher Effectiveness and Teacher Professional Development

Keywords: Assessment methods and tools, Lifelong learning, Qualitative methods, Quantitative methods, Teacher Effectiveness, Teacher professional development, Teaching approaches, Teaching/instruction, Technology

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 18 - Educational Effectiveness

Chairperson: Alexander Eitel, University of Freiburg, Germany

A preliminary typology of teachers with multiple jobs based on professional life stories

Keywords: Lifelong learning, Qualitative methods, Teacher Effectiveness, Teacher professional development

Presenting Author:Lianne Teder, Tallinn University, Estonia; **Co-Author:**Rain Mikser, Tallinn University, Institute of Educational Sciences, Estonia

In many fields, the percentage of professionals having one or more jobs in addition to their full-time main job is increasing across the world. With numerous members but often relatively modest salaries, teachers are a professional group among the most affected by this tendency. Traditionally, 'moonlighting' (the commonly used term for having an additional job) is considered as highly problematic for teachers' capability to fulfil their teaching responsibilities. However, little attention has been paid to the potential that 'teachers-moonlighters' could have for contributing to school life by using their out-of-school working experience. This article introduces a small-scale narrative study with teachers from Estonia and proposes a preliminary typology of teachers with multiple jobs. Providing examples from narrative life history interviews, we argue that certain types of teachers have a specific potential to enrich the school life. Two dimensions appeared to be most indicative for categorising teachers with multiple jobs: the *permanence* of and the *self-actualization* through multiple jobs. We argue that these dimensions are promising for further discussion of teacher career patterns in which case multiple jobs can be seen not obstructive but instead contributing for teachers' professionalism.

Investigating the Effectiveness of an Individualized Coaching Approach for Mathematics Teachers

Keywords: Teacher Effectiveness, Teacher professional development, Teaching approaches, Teaching/instruction

Presenting Author:Dionne Cross Francis, Indiana University, United States; **Co-Author:**Ji Hong, University of Oklahoma, United States

Ambitious instruction aims to support all students in acquiring, understanding and using knowledge to solve authentic mathematics problems. Given the range of knowledge and skills teachers need to engage in ambitious mathematics instruction, they often need ongoing professional development (PD) and support. The nature of this support however has varied producing a range of results. In this study, we examine the relative effectiveness of three PD approaches focused on improving their mathematical knowledge for teaching (MKT) and quality of instruction (MQI). One approach incorporates a holistic, individualized coaching (HIC) model exclusively. The design of the other two approaches aligns with the core features of effective PD as described by Yoon (2007) and includes one round of HIC. The HIC approach applied in these programs extends common coaching models that have a concentrated focus on the cognitive aspects of mathematics teaching, and draws on insight from psychological and affective dimensions of teaching. The key finding is that teachers involved in the HIC program had significant gains in their knowledge of content and students over teachers involved in the other two programs along with greater changes in the mathematical quality of their instruction. This result suggests initiatives designed to influence teacher change should attend not only to the cognitive (i.e. MKT), but also the affective and psychological dimensions of teaching.

Fostering teachers' competences in the context of digital transformation – evidence from Switzerland

Keywords: Quantitative methods, Teacher professional development, Teaching/instruction, Technology

Presenting Author:Josef Guggemos, University St.Gallen, Switzerland; **Co-Author:**Sabine Seufert, University of St.Gallen, Switzerland

Digital transformation is expected to have far-reaching impact on the society. In this light, the adequate handling of digital transformation is under debate in educational policy and practice. Two aspects are of major interest: First, what knowledge, skills, and abilities people should possess in an increasingly digital environment and how these elements can be fostered. Second, how digital tools can help to improve or enrich learning processes. The perceived pressure to make changes, however, comes along with a high degree of uncertainty. Policy makers who aim at teachers' professional development might require evidence about the effectiveness of training measures. Relying on theory of planned behavior, we identify determinants of teachers' use of digital content and technology-supported learning and assessment. Using a sample of 215 Swiss teachers and SEM-PLS in combination with item-performance-map analysis, we identify media didactical skills as decisive for teachers' use of technology-supported teaching and assessment. In terms of digital content use, teachers' ability to foster students' digital skills is most influential. Surprisingly, content knowledge and negative attitudes towards digital transformation do not influence use of digital content and use of digital supported learning and assessment. For both types of use, pedagogical knowledge, positive attitudes, and teachers' own digital skills are crucial.

Measuring science instruction with a tablet e-portfolio: Reliability with units of different length

Keywords: Assessment methods and tools, Teacher Effectiveness, Teacher professional development, Teaching/instruction

Presenting Author: Jose Felipe Martinez, University of California, United States; **Co-Author:** Matthew Kloser, University of Notre Dame, France; **Co-Author:** Jayashri Srinivasan, University of California, Los Angeles, United States; **Co-Author:** Brian Stecher, The RAND Corporation, United States; **Co-Author:** Amanda Edelman, The RAND Corporation, United States

Teacher portfolios hold promise for providing rich evidence to inform reliable and valid judgments about instruction and to support self-reflection anchored in authentic artifacts of practice. This study examined a novel type of teacher e-portfolio tool for mobile devices. The tablet portfolio app allows teachers to capture artifacts of classroom practice (e.g. lesson plans, assessments, samples of student work or discourse, etc) in multimedia formats (document, image, video) with annotations to help interpret these artifacts in context. We investigated the psychometric properties of measures of quality science instruction derived from the portfolio app. Trained raters scored the contents of portfolios collected by 40 teachers using rubrics aligned to the Next Generation Science Standards being implemented in the United States. Specifically, in this paper we compare the reliability of measures of instruction based on portfolios that cover science units spanning one and two weeks of instruction. We find comparable levels of reliability—for some dimensions of instruction, reliability is in fact higher with shorter portfolios. Teacher interviews further illuminate the potential formative value of portfolio collection. We discuss implications and next steps for using tablet e-portfolios for instructional assessment and improvement.

Session K 17

14 August 2019 12:00 - 13:30

Seminar Room - S02

Single Paper

Evolutionary Educational Psychology: Considering Primary Knowledge to Facilitate Learning

Keywords: Cognitive skills, Comprehension of text and graphics, Educational Psychology, Experimental studies, Higher education, Instructional design, Language (Foreign and second), Motivation, Reasoning, Science education, Self-regulation, Teaching/instruction

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing

Chairperson: Florence Lespiau, University of Toulouse, France

Motivate Learners and Promote Formal Logic Learning through Primary Knowledge

Keywords: Cognitive skills, Educational Psychology, Motivation, Reasoning

Presenting Author: Florence Lespiau, University of Toulouse, France; **Co-Author:** André Tricot, University of Toulouse, France

Evolutionary approach differentiates two types of knowledge: primary knowledge for which our brain would have evolved (processed effortlessly, quickly and intrinsically motivating) and secondary knowledge for which our cognitive architecture would not have enough time to evolve (requiring cognitive resources for processing, time and effort to be learned, and for which we would have little motivation to deal with). Thus the knowledge that results in learning and taught in schools is secondary knowledge and is thought of as constructed from primary knowledge. This study seeks to use primary knowledge to foster the involvement and performance of individuals in a learning task that is not inherently engaging: learning the normative rules of logic. In three experiments, we varied the contents of logical problems (related to primary or secondary knowledge) in a first phase and observed the impact on participants' involvement in the training phase and on performance in a final test. The results showed that participants performed better, were more motivated and experienced less cognitive load when faced with primary knowledge contents. Primary knowledge contents involved more participants who chose to stay longer on the training task regardless of their personal characteristics. However, contenting oneself with primary knowledge would not be enough to learn and one would have to go through secondary knowledge for that. Finally, this study provides a cost-efficient way to present new learning content using primary knowledge that should be taken into account and not left aside because it is "already learned".

Gesturing and Manipulations: Primary Skills that Aid Attaining Secondary STEM Skills

Keywords: Educational Psychology, Higher education, Science education, Teaching/instruction

Presenting Author: Juan Cristobal Castro-Alonso, Universidad de Chile, Chile; **Co-Author:** Paul Ayres, University of New South Wales, Australia; **Co-Author:** Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Biologically primary skills (e.g., speaking one's native tongue and understanding gestures) require less cognitive processing than biologically secondary skills (e.g., writing and advanced mathematics). Cognitive load theory has been investigating different primary skills that could be used as vehicles to attain the more demanding secondary skills. In this theoretical paper, we describe two primary skills, gesturing and object manipulation, as effective means to attain knowledge about science, technology, engineering, and mathematics (STEM) topics. We provide successful examples of this approach for higher education. Also, although both gesturing and object manipulation are similar hand actions, we describe their differences and how these differences affect STEM instruction. We also report the divergences between (a) observing and (b) observing and executing gesturing and manipulations. We end by discussing the instructional implications of using these human hand actions to teach STEM topics for university students.

Does Foreign Language Learning Concern Primary or Secondary Knowledge?

Keywords: Educational Psychology, Experimental studies, Higher education, Language (Foreign and second)

Presenting Author: André Tricot, University of Toulouse, France; **Co-Author:** Stéphanie Roussel, LACES - University of Bordeaux, France; **Co-Author:** John Sweller, University of New South Wales, Australia

For several centuries, foreign language learning has alternatively been considered as "natural" (the best learning conditions should be similar to those of native language acquisition) or as "formal" (teaching a foreign language needs explicit tuition). From an evolutionary educational psychology point of view, spoken mother language learning constitutes primary knowledge which means learning is implicit. For a foreign language learned as an adult, we can consider three alternative hypotheses. Learning a foreign language involves: (a) primary (implicit) knowledge; (b) secondary (explicit) knowledge; (c) both primary and secondary knowledge. Usually, English as a Medium of Instruction assumes a radical version of the first hypothesis, that a foreign language can be learned implicitly at the same time as acquiring academic knowledge. We tested this hypothesis experimentally. Students had to learn specific content and a foreign language simultaneously in three conditions: the content was presented in the foreign language only, in the mother language only or in both. Using either written or spoken text, the results show that the foreign language condition led to suboptimal results for both content and language learning. Our results are not compatible with the hypothesis that learning a foreign language involves primary, purely implicit knowledge.

Finger Pointing to Self-manage Cognitive Load in Learning from Split-attention Examples

Keywords: Comprehension of text and graphics, Educational Psychology, Instructional design, Self-regulation

Presenting Author:Shirong Zhang, Erasmus University Rotterdam, Netherlands; **Co-Author:**Bjorn B. de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Given the increasing awareness that learners are responsible for their own learning processes, researchers have started to explore possibilities to instruct learners to self-regulate their cognitive load during learning. Using the theoretical frameworks of Cognitive Load Theory and embodied cognition, this study investigates the impact of instructions to physically integrate mutually referring, but spatially separated text and pictures (split-attention material). One hundred-and-twenty university students study spatially separated text-picture materials by pointing at the corresponding textual and pictorial information either with their index finger of both hands, the index finger of one hand or without such pointing, or by studying a spatially integrated format of the same material. We hypothesize that learners who learn from the split-attention materials by finger pointing will outperform (higher test scores and/or lower cognitive load) learners who learn from the split-attention materials without finger pointing and learners who learn from the integrated materials. It is also expected that learners who learn from the split-attention materials by finger pointing will outperform learners who use only one hand during learning. Moreover, we expect a transfer of self-management strategy by using finger pointing to a novel task. We expect that the current study will advance our understanding about the link between biologically primary knowledge (using finger pointing) and secondary knowledge (knowledge in learning tasks) and allow us to understand how we can potentially "add value" to the self-management of cognitive load effect by emphasizing the use of hand movement.

Session K 18

14 August 2019 12:00 - 13:30

Seminar Room - S01

Single Paper

Learning and Instructional Technology

Computer-Assisted Learning

Keywords: Artificial intelligence, Cognitive development, Computer-assisted learning, Inquiry learning, Learning Technologies, Motivation, Pre-service teacher education, Qualitative methods, Science education, Vocational education, Writing/Literacy

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 20 - Inquiry Learning

Chairperson: Thorsten Scheiner, Australian Catholic University, Australia

Siri and 'friends' challenging the research on speaking and writing, conceptual issues and outlooks

Keywords: Artificial intelligence, Computer-assisted learning, Qualitative methods, Writing/Literacy

Presenting Author:Béatrice Arend, University of Luxembourg, Luxembourg; **Co-Author:**Pierre Fixmer, Institut of Education and Society (InEs), Luxembourg

Our paper aims at launching a discussion on how innovative built-in speech recognition software (*Siri* and 'friends') is currently challenging the 'traditional' research on speaking and writing related to language learning. Our theoretical considerations focus on how *Siri* is a promising tool for eliciting and enhancing thinking about language. With regard to its key feature enabling Apple devices to recognize and to produce oral natural language and to convert it in real time to written text, *Siri* prompts reflection on the complex dynamics between the Oral and the Written. Research on speaking and writing in terms of language learning is mainly concerned with pathways to language awareness. Thus, sociocultural theorists assert that writing is closely intertwined with abstract thinking and concept formation. Many scholars emphasize on the differences between the spoken and the written word: the former is linearly unfolding in real time, dynamic, and fades rapidly away, the latter is addressing a distant 'other', displayed in space, and persists over time. Following this line of research, we will give some outlooks on how *Siri* can (and will in the future) contribute to provide oral speech flow with reflexive planning and intentional effort 'traditionally' assigned to writing. Moreover, we will point out how *Siri* can raise learners' awareness and understanding of the word as a meaningful piece of language and object of thought.

Comparative feedback and reflection as a factor in student-centered learning in vocational education

Keywords: Cognitive development, Computer-assisted learning, Learning Technologies, Vocational education

Presenting Author:Elise Eshuis, University of Twente, Netherlands; **Co-Author:**Judith ter Vrugte, University of Twente, Netherlands; **Co-Author:**Anjo Anjewierden, University of Twente, Netherlands; **Co-Author:**Ton de Jong, University of Twente, Netherlands

With vocational education becoming more and more student-centered, self-regulated learning skills, and therefore knowledge monitoring, are of growing importance. However, students are often unaware of their knowledge and possible misconceptions. Though concept mapping can facilitate students' knowledge monitoring and stimulate awareness by means of externalization and visualization of knowledge, students might still fail to identify possible misconceptions and gaps in their knowledge. Therefore, in this study it is investigated whether providing an expert example and reflection prompts could further optimize the effectiveness of concept mapping. First year secondary vocational technical students (N=196) worked in an online inquiry learning environment centered around simulations concerning electricity and electric power transmission, in which, on four occasions, they had to present their knowledge in a concept map. Three conditions were compared: students who received 1) an expert example of a concept map and reflection prompts, 2) an expert example, or 3) no expert example and no prompts. Analyses of knowledge tests reveals significant learning gains in all conditions. Although activating the expert concept map significantly predicts learning gains, the results do not favor one condition over the other.

Trade-offs between time-on-task and retrospective action in computer supported inquiry learning

Keywords: Computer-assisted learning, Inquiry learning, Learning Technologies, Science education

Presenting Author:Nikoletta Xenofontos, University of Cyprus, Cyprus; **Co-Author:**Tasos Hovardas, University of Cyprus, Cyprus; **Co-Author:**Zacharias Zacharia, University of Cyprus, Cyprus; **Co-Author:**Ton de Jong, University of Twente, Netherlands

In this study, we examined the effect that scaffolding, which varies in terms of structuring (i.e., supporting complex learning tasks) and problematizing (i.e., adding complexity locally to drive student attention to aspects that would otherwise remain unaccounted for), has on tenth-graders' knowledge and actions when experimenting and collecting data through an inquiry-oriented virtual lab environment and later using these data for constructing graphs in the domain of electric circuits. We used two different configurations of scaffolding in a data-viewer tool. In condition 1 students received less structuring and more problematizing, whereas in condition 2 they received more structuring and less problematizing. The data collection involved student on-screen actions and time spend per action, learning products, and performance on a knowledge-test. Both conditions were found to be equally effective knowledge-wise and they both triggered retrospective action (i.e., revisiting inquiry phases and tasks). The time of retrospective action was found to relate to the time-on-task spent when passing through the various inquiry phases and tasks for the first time. There seems to be a minimum amount of time that was necessary for effectively executing tasks during the first inquiry pass and if this time had not been allocated by the students, they had to proceed with retrospective action to compensate for time not spent initially. These findings point toward a novel field of research for inquiry learning, which is outlined by trade-offs between the time-on-task spend during the initial pass and the time spend on subsequent revisits of the inquiry tasks.

Students' perceptions & need for relatedness in blended learning: A learning analytics intervention

Keywords: Computer-assisted learning, Learning Technologies, Motivation, Pre-service teacher education

Presenting Author:Elise Ameloot, Ghent University, Belgium; **Co-Author:**Tijs Rotsaert, Ghent University, Belgium; **Co-Author:**Tammy Schellens, Ghent University, Belgium

Although Blended Learning (BL) has many opportunities for flexible learning, it also poses some challenges. One of the challenges is to keep students motivated. The general goal of this study is to investigate if and how Learning Analytics (LA) can have an effect on motivation and more specifically on students' basic need for relatedness, which is a dimension of motivation. LA data from a learning management system are used to give instructors more insight into students' online activities. Furthermore, it is explored whether instructors could make the learning environment and activities within it more personalized, as to promote students' motivation. Besides, students' perceptions about the use of LA are investigated. This study is conducted in an authentic BL context in teacher

education: a quasi-experimental intervention study was executed during 3 months using a mixed-method approach (N = 261 students). Against our expectation, the quantitative results did not indicate a significant effect on students' relatedness. However, overall students' perceptions towards the use of LA are positive. Important recommendations for the use of LA are made.

Session K 19

14 August 2019 12:00 - 13:30

Seminar Room - S10

Single Paper

Culture, Morality, Religion and Education, Learning and Social Interaction

Moral and Democratic Education

Keywords: Attitudes and beliefs, Citizenship education, Developmental processes, Emotion and affect, Environmental education, Experimental studies, History, Morality, Qualitative methods, Social development, Social interaction, Teaching/instruction

Interest group: SIG 13 - Moral and Democratic Education

Chairperson: Katharina Neuber, University of Duisburg-Essen, Germany

Not Able to Resist the Temptation: The Moral Landscape of Bystanders of Bullying

Keywords: Emotion and affect, Morality, Social development, Social interaction

Presenting Author: Eveline Gutzwiller-Helfenfinger, University of Fribourg, Switzerland

School bullying negatively affects the social and learning climate in classrooms, has grave psychosocial consequences for all children involved, and impairs students' academic achievement. Bystander behaviour during bullying episodes has an impact on the ongoing process by either stopping or reinforcing it. Research has consistently reported negative relationships between moral competencies and aggression and bullying. In qualitative research, only active moral rule transgressions have been used so far to measure individuals' moral functioning. We explored whether systematic relationships could be found between involvement in bullying, including different bystander behaviours, and participants' socio-moral meaning making in the context of a passive moral temptation situation.

330 14-year-old Swiss students (48% male) filled in a questionnaire on involvement in bullying and wrote answers to open-ended questions in a passive moral temptation scenario (receiving too much change [10 Euros]). Self-reported involvement in bullying included victimization, bullying, and bystanding (ignoring, helping the victim, supporting the bully) as well as cyberbullying and cybervictimisation ($\alpha=.71-.89$). Scenario answers were content analysed. Inter-rater reliability (18% of scenarios) was high (perfect agreement=.88).

Moral competencies in the context of passive moral temptations were meaningfully related to involvement in bullying. Bystander behaviour was differentially related to moral disengagement, with supporting the bully showing positive and helping the victim showing negative associations. These findings call for targeted prevention and intervention involving bystanders. As bullying seriously impacts academic performance at school, such interventions might contribute to improving social relationships in the classroom as well as the quality and outcomes of teaching-learning processes.

Smart morality: Happy victimizing, moral hypocrisy, and moral resilience in a game-theoretic context

Keywords: Experimental studies, Morality, Social development, Social interaction

Presenting Author: Gerhard Minnameier, Goethe-Universität Frankfurt, Germany; **Co-Author:** Tim Bonowski, University of Frankfurt, Germany

Happy victimizing (HV) and moral hypocrisy (MH) are well-known concepts in social psychology, moral education and behavioural economics. In all those domains, they indicate immoral behaviour, and the most common response to this is to call for more moral motivation and for strengthening moral resilience. In the first part, we show in how far this general educational approach is doomed by drawing on a game-theoretic analysis of the situations in which HV and MH are typically observed. This analysis reveals why even "good people" are prone to HV or to exert MH, and that there is much more to it than just a lack of moral character. However, this does not mean that moral resilience is futile altogether and that honesty never pays. In the second part, we show how moral resilience can stabilise cooperation and ward off defection in repeated and quasi-repeated prisoner dilemmas (PD). The dynamics of these games help us overcome two folk wisdoms that are very common, but erroneous: (1) Defection in a PD is immoral; (2) Cooperation in a PD is irrational. Accordingly, the analysis yields important insights for the education of "smart moralists".

Educational democratic values in Vietnamese secondary education

Keywords: Attitudes and beliefs, Citizenship education, Environmental education, Qualitative methods

Presenting Author: T.T.Tinh Le, ICLON-Leiden University Graduate School of Teaching, Netherlands; **Co-Author:** Dineke Tigelaar, Leiden University, Netherlands; **Co-Author:** Wilfried Admiraal, Leiden University, Netherlands

1. Abstract Although democracy is not a new concept in education, it is still a sensitive one in communist countries. Many studies have addressed democracy in education around the world, but research on democracy in education in the context of communist societies such as Vietnam has been scarce. This study is aimed at exploring the educational democratic values of stakeholders in Vietnamese secondary schools and participants' thoughts about acting upon these democratic values in their schools. In-depth interviews were conducted among nine participants, involving two principals, four teachers, and three students in two high schools in the city of Da Nang, Vietnam. The results shed light on democratic values that stakeholders in Vietnamese secondary schools find important and on their deliberations with regards to acting upon these values. There seems to be a connection between the participants' absorption in the Confucian culture and their intended democratic behaviours. **Keywords:** Social aspects of learning and teaching; values education; morality; secondary education

Learning and development of historical thinking from a historical-cultural perspective

Keywords: Developmental processes, Emotion and affect, History, Teaching/instruction

Presenting Author: Natalia Alborno, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Christian SEBASTIÁN, Pontificia Universidad Católica de Chile, Chile

Historical thinking as a sophisticated form of thinking about the past, which allows us to discuss the present and project the future, it is a subject that has had significant development in the last three decades. Within historical thinking, different dimensions have been described, which vary according to the authors, such as sourcing, causal reasoning, change and continuity, ethical judgments and historical empathy. Regarding the learning and development of historical thinking in educational environments, different authors have investigated pedagogical practices that promote it, either by describing real practices in classrooms or with experimental or quasi-experimental designs that test different teaching methodologies. However, there are two problems identified in the literature review. The first one is what happens with those aspects that have demonstrated to be more difficult to develop: contextualization, perspective taking and historical empathy. However, it is not just a problem in empirical terms but also in theoretical terms and is that the authors have not reached consensus on the distinction of concepts such as taking perspective and historical empathy and on the place of emotions within historical thinking. The second problem that we try to address is the absence of a theoretical psychological explanation that can enlighten how historical thinking develops and why some dimensions are more challenging to develop. Therefore, we propose to understand the problem from a historical-cultural perspective, specifically from Vygotsky's concept of cultural mediation and cultural tool.

Session K 20

14 August 2019 12:00 - 13:30

Seminar Room - S15

Single Paper

Online and Computer-supported Collaborative learning

Keywords: Computer-supported collaborative learning, Cooperative/collaborative learning, Developmental processes, E-learning/ Online learning, Educational technology, Ethnography, Higher education, Qualitative methods, Quantitative methods, Reflection, Secondary education, Social interaction, Vocational education

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research

Chairperson: Ellen Kok, Utrecht University, Netherlands

Process-oriented and collaborative learning of new software for the workplace

Keywords: Computer-supported collaborative learning, Cooperative/collaborative learning, Reflection, Vocational education

Presenting Author: Mandy Hommel, TU Dresden, Germany

Within a research project, it was investigated how the learning of enterprise resource planning software (ERP) is supported by different conditions of a formal learning setting. The learning environments were either built upon single steps to get familiar with software functions and navigation or problem-oriented and based on business processes, in a single or dyadic learning condition. Data of knowledge pre- and post-tests were gathered. Additionally, learners were asked to reflect their learning processes. The data show the best results of learners in the process-oriented dyadic condition. Learners' reflection of their own learning processes revealed a fragmented perspective on the business process controlled by means of the software for learners in the function-oriented condition. Additionally, learners in this condition perceived their learning as superficial.

Investigating the (im)permeable membrane of virtual sites for learning: critical explorations

Keywords: E-learning/ Online learning, Ethnography, Higher education, Social interaction

Presenting Author: Giulia Messina Dahlberg, University of Gothenburg, Sweden

By bringing together data from three different multisited (n)ethnographic projects, (CINLE - Communication and identity processes in net-based learning environments, 2010-2016, PAL - Participation for all? School and post-school pathways of young people with functional disabilities, 2017-ongoing and HRIE - Human-robot interaction education, 2017-ongoing) where participants use and inhabit a range of digital tools and practices, this paper aims to critically explore (also in terms of researchers' reflexivity) and make visible the complexities of interaction and collaboration during educational activities in and across physical/virtual learning sites. This is done by turning the analytical gaze on what *gets in and out* those spaces, including how and for what purposes, rather than what happens "inside" a particular site. I draw on the concept of *selective permeability*, a notion borrowed from the discipline of biology to describe the property of cellular membranes to only allow specific molecules to enter or exit the cell. By turning the spotlight on certain aspects of (online) educational practices that are taken for granted, the metaphor of learning spaces as constituted by the relations of tools and living organisms surrounded by a permeable membrane that *actively* selects what gets in and out, this paper aims to contribute to the body of research that deals with processes of continuity, discontinuity and boundary crossing from sociomaterial perspectives.

Combining data mining and traditional statistics: An example from educational technology research

Keywords: E-learning/ Online learning, Educational technology, Higher education, Quantitative methods

Presenting Author: Elisabeth Duursma, University of Wollongong, Australia; **Co-Author:** Carlos González-Ugalde, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Sarah Howard, University of Wollongong, Australia; **Co-Author:** Jie Yang, University of Wollongong, Australia; **Co-Author:** Jun Ma, University of Wollongong, Australia

The fields of Educational Data Mining (EDM) and Learning Analytics (LA), coming from computer science, have provided new ways to explore educational questions. Specifically, these have developed into active fields of research applying data mining, machine learning, visualization techniques and traditional statistical approaches to examine educational practice, students learning paths and patterns in educational data. The overall aim of both fields to improve educational practice and inform learning. In the area of educational technology, these approaches are well suited to data captured through online platforms and tools. However, while educational technology researchers are aware of these new approaches, the methods are not commonly used in educational research. To bring these areas of practice closer together, this paper considers how data mining approaches can build on more traditional statistical analysis, for a better understanding of research findings. This analysis focuses on data collected on students' online learning and library activities at a Chilean university. Comparisons are drawn between regression analysis and a combined data mining approach, including fuzzy sets and association rules analysis. Findings demonstrate how the data mining approach reveals patterns of student usage to gain a deeper understanding of the regression results and students' online behaviours. Implications for future combined analyses are discussed.

Digitalization in upper secondary schools in Switzerland: Principals' leadership, beliefs and goals

Keywords: Developmental processes, E-learning/ Online learning, Qualitative methods, Secondary education

Presenting Author: Michael Ruloff, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:** Dominik Petko, University of Zurich, Switzerland

Digital technologies are transforming the job market and pose new challenges to education, yet there is no research that specifically examines digital development in upper secondary schools in Switzerland. The project 'concepts of digitalization in upper secondary schools in the canton of Schwyz' focuses on digital development in all upper secondary schools in Schwyz (Central Switzerland). To get an insight into pedagogical beliefs and goals regarding digital transformation at upper secondary schools, all principals of the relevant schools (two public schools, three private schools and four vocational matriculation schools) were interviewed about attitudes, values, ideas, but also personal visions and leadership. The research data collection includes the transcribed qualitative interviews. Furthermore, all principals responded to a standardized questionnaire about personal views on the digital future of their schools. The data is evaluated using content analysis to generate a picture of overall trends through the development of categories or keywords contained in the transcribed texts. Moreover, the questionnaire data allows a quantitative description of principals' views. The main focus lies on principals' pedagogical beliefs. Though digital development in the examined schools is different, principals' statements in the interviews show that pedagogical beliefs as well as their management style or leadership are crucial in relation to digitalization in upper secondary schools.

Session K 21

14 August 2019 12:00 - 13:30

Seminar Room - S06

Single Paper

Learning and Social Interaction

Model-based Reasoning and Argumentation in Science Education

Keywords: Argumentation, Content analysis, Inquiry learning, Instructional design, Model-based reasoning, Peer interaction, Reasoning, Science education

Interest group: SIG 20 - Inquiry Learning, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Jule Krüger, Universität Duisburg-Essen, Germany

Teaching science through curriculum-supported argumentation: Learning through arguing and thinking

Keywords: Argumentation, Instructional design, Peer interaction, Science education

Presenting Author: Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:** Patricia López, Universidad Alberto Hurtado, Chile; **Co-Author:** Jorge

Pinochet, Universidad Alberto Hurtado, Chile; **Co-Author:**Katherine Strasser, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Christine Howe, University of Cambridge, United Kingdom; **Co-Author:**Selma Leitao, Universidad Federal de Pernambuco, Brazil; **Co-Author:**Camila Moran, Universidad Alberto Hurtado, Chile; **Co-Author:**Alvaro Sanchez, Universidad Alberto Hurtado, Chile; **Co-Author:**Maximiliano Silva, Universidad Alberto Hurtado, Chile; **Co-Author:**Constanza Villavicencio, Universidad Alberto Hurtado, Chile; **Co-Author:**Carla Varela, Universidad Diego Portales, Chile

The use of argumentation has been shown to prompt science reasoning development and concept learning. However: (1) Argumentation is rarely found in classrooms and causal evidence gathered in classrooms with teaching led by teachers is still scarce; (2) Evidence showing students' outcomes, in terms of both disciplinary knowledge and general argumentative skills (both relevant for science learning), is also scarce. We conducted an experimental study randomized at class level, to evaluate the effect of two types of curriculum support for promoting argumentation (printed and computer) on disadvantaged students' disciplinary content knowledge and argumentative skills. 20 COUNTRY public classes and teachers, and 502 fourth-grade students (aged 10–11), participated in the study. Eight teachers taught a science unit (Forces) following a programme especially developed to foster classroom argumentation (experimental printed group); seven teachers taught following the same programme but using tablet-supported software (experimental technology group); and five teachers taught *as usual* (control group). Students were measured on content knowledge and argumentation skills pre- and post- intervention. The results showed no differences in pre- to post- gains in disciplinary content knowledge by condition, but there were differences in argumentation skills gains, favoring the experimental groups. Only in the experimental groups argumentation skills and frequency of argumentative utterances during group work significantly predicted post-delayed disciplinary content knowledge. Finally, although in the control group students from schools with a higher proportion of vulnerable students had significantly lower achievements at the post-delayed knowledge test, in the experimental conditions students did not differ at delayed post-tests.

Towards a definition and measurement of socio-scientific argumentation: A literature review

Keywords: Argumentation, Content analysis, Reasoning, Science education

Presenting Author:Olga Ioannidou, Ludwig Maximilian University, Germany; **Co-Author:**Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

The concept of socio-scientific argumentation (SSA) has recently been introduced in science education classrooms. As the concept became a part of national curricula, there has been an increasing trend of publications on the topic of SSA. However, there is no consensus among researchers of how socio-scientific argumentation (SSA) is defined and measured in science education. To tackle this issue, this study investigates the way in which researchers (a) define and (b) measure SSA. An integrative literature review was conducted and a mixed-methods approach was followed. Data was gathered from two electronic databases (Web of Science and EBSCO); from 638 articles retrieved, 69 articles were included in the full-text analysis phase. A coding scheme was developed using inductive and deductive approaches. The final version consisted of 29 codes and 101 sub-codes and the articles were analyzed with content analysis approaches. The inter-rater reliability ranged between .79 and .89. Among other findings, three themes were identified regarding SSA definitions and 78% of articles highlighted the moral aspect of SSA in their definitions. With regard to measurements of SSA, eight argument assessment criteria were identified; 68% focused on the argument structure and 18% used Toulmin's Argumentation Pattern (TAP). With this literature review, we aim to offer a cohesive framework for defining and measuring SSA. By doing so, we aspire to initiate a dialogue regarding the nature of SSA and special properties of SSA measurements.

Examining argumentative essays across a curriculum and identifying ruling-out arguments

Keywords: Argumentation, Inquiry learning, Model-based reasoning, Science education

Presenting Author:Hebbah El-Moslimany, Rutgers University, United States; **Co-Author:**Clark Chinn, Rutgers University, United States; **Co-Author:**Ravit Duncan, Rutgers University, United States; **Co-Author:**Elizabeth O'Brien, Rutgers University, United States

Argumentation includes both construction and critique of the argument. Arguments often focus on students developing claims supported by evidence, but not on ruling-out claims due to contradictory evidence. Arguments that include evidence that contradicts a model are important for science, because it is ruling-out a model based on contradictory evidence. Ruling-out arguments are a special form of counterargument that strongly militate against a model or explanation due to the strength of evidence and to its contradiction of core elements of the model. We examined differences in students' arguments and their competence using ruling-out argument, and report our analysis of written assessment tasks that occurred across five months of a life-sciences model-based inquiry curriculum. The tasks asked students to choose between two comparable, competing models of a phenomenon and write an argument in support of their chosen model. Students were provided with multiple pieces of evidence (between four to nine pieces of evidence) that varied in quality. Across the five months of the curriculum, we found students initial essays did not include any ruling-out arguments, and most ruling-out arguments were found closer to the end of the curriculum. We focused on ruling-out arguments, because often scientists rule out models due to contradictory evidence. This type of argument is understudied, and our research points to instructional approaches to encourage students to compare, contrast, and critique evidence.

Students' Use of Epistemic Criteria Across Model Evaluation Tasks

Keywords: Inquiry learning, Model-based reasoning, Reasoning, Science education

Presenting Author:Na'ama Av-Shalom, Rutgers University Graduate School of Education, United States; **Co-Author:**Brandon Mauclair-Augustin, Rutgers University, United States; **Co-Author:**Hebbah El-Moslimany, Rutgers University, United States; **Co-Author:**Veronica Cavera, Rutgers University Graduate School of Education, United States; **Co-Author:**Ravit Duncan, Rutgers University, United States; **Co-Author:**Clark Chinn, Rutgers University, United States

Inquiry across various scientific disciplines involves modeling, and scientists use epistemic criteria to guide their generation, evaluation, and revision of scientific models. Research has shown that students are able to use some epistemic criteria when evaluating models even prior to formal instruction. However, we do not know how students' use of criteria varies (if at all) when they engage in different aspects of modeling practice such as model revision, evaluation, or generation; nor do we know whether these different aspects of modeling afford different uses of criteria. In this study we compared middle school students' use of epistemic criteria in a pre-assessment which included model evaluation and model revision tasks. We found that students evoked scientifically appropriate criteria in both tasks, but with different usage patterns. In particular, analyzing the two tasks revealed more strengths and weaknesses than would have been captured through only one of the tasks, including an ability prioritize primary criteria and a misunderstanding about the relationship between models and evidence, each of which is identified in different tasks. This suggests that model evaluation and revision tasks have different affordances with respect to criteria usage, and that students' modeling proficiency should be evaluated using a variety of different tasks, as their understanding of epistemic criteria in science is more developed than may be captured by a single task.

Session K 22

14 August 2019 12:00 - 13:30

Seminar Room - S04

Single Paper

Assessment and Evaluation

Assessment Methods and Tools

Keywords: Achievement, Assessment methods and tools, At-risk students, Comparative studies, Competencies, Higher education, Psychometrics, Quantitative methods, Reading comprehension, Secondary education

Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics

Chairperson: Cyril Brom, Czech Republic

Choosing a study for higher education: The identification of decision-making profiles

Keywords: Assessment methods and tools, At-risk students, Higher education, Secondary education

Presenting Author:Lien Demulder, KU Leuven, Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium; **Co-Author:**Marlies Lacante, Faculty Psychology and Educational Sciences, Belgium

In Flanders (Belgium) access to higher education is unconstrained and tuition fees are low. This, however, leads to low study success (Jagers, 2017). To better support the decision-making process of students, Germeijs and Verschueren (2006) developed the Study Choice Task Inventory (SCTI). They identify six career-decisional tasks that are important in this decision-making process: orientation, exploration of oneself, broad exploration, in-depth exploration, decisional status and commitment. The current study attempts to identify decision-making profiles of students choosing a study for higher education, using a sample of 1461 students in their last year of the general track of secondary education. By performing latent class analysis on the students' scores on the six decisional tasks, four clusters were identified: (1) scoring average on the orientation and exploration scales but low on the decisional status and commitment scale, (2) scoring low on all six scales, (3) scoring average on the orientation and exploration scales but high on the decisional status and commitment scale, and (4) scoring high on all six scales. Results also indicate significant differences between the identified clusters and their scores on self-efficacy, attitude, motivation, time management, self-regulation and lack of regulation.

Development of an adaptive Flemish reading comprehension test for secondary school students

Keywords: Assessment methods and tools, Competencies, Reading comprehension, Secondary education

Presenting Author:Blijde Van Driessche, University of Ghent, Belgium; **Co-Author:**Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Hilde Hacqueboard, University of Groningen, Netherlands; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Michiel Hol, Independent Researcher, Netherlands

Developing proficient reading comprehension skills is indispensable throughout students' entire school career and remains essential in daily life. Developing these skills starts in primary education, but requires further development and refinement during secondary education, where students are confronted with a wide variety of text genres. Therefore, it is of importance to gain insight into these skills and provide attuned instruction. In this respect, it is recommended to use validated and norm-referenced tests, to facilitate monitoring of students' individual progress in view of differentiated instruction. The present study focusses on the development of an adaptive Flemish reading comprehension test for secondary education, called 'Diatekst'. Diatekst was initially developed in the Netherlands. However, notwithstanding the fact that Flanders (The Dutch Speaking part of Belgium) and The Netherlands share Dutch as the same language, the original Diatekst test was not specifically attuned to the Flemish educational context, making adjustment imminent. Test development was undertaken through three successive stages: (1) content development, (2) pilot testing of newly developed test material, and (3) a calibration design. In this study, these three consecutive stages are described and preliminary results are discussed. **Keywords:** reading comprehension, secondary school students, test development, adaptive testing

A psychometric validation of the three dimensions of the short-form CART (Stanovich et al., 2017).

Keywords: Achievement, Assessment methods and tools, Higher education, Psychometrics

Presenting Author:Marion Tillema, Avans Hogeschool / Avans University of Applied Sciences, Netherlands

This study addresses a psychometric validation of the short-form Comprehensive Assessment of Rational Thinking (Stanovich et al., 2017). The short-form CART is assumed to assess three dimensions of rationality: processing, declarative knowledge and contaminated mindware. If these dimensions are accurate and accurately incorporated in the CART, the test items that are intended to assess one of the dimensions should be on a unidimensional scale statistically. This means that each test item included in such a unidimensional scale should sufficiently discriminate between individuals. Items which have insufficient discriminative power are not scalable, indicating that they do not belong to the assumed theoretical dimension. The research question is: to what degree do CART test items discriminate between students who differ on the latent traits measured, assuming that these are processing, declarative knowledge and contaminated mindware? Respondents were 187 first-year students of Mechanical Engineering and Electrical and Computer Engineering at Avans University of Applied Sciences in 's-Hertogenbosch, the Netherlands, aged 18 – 23. They were presented with the short-form CART in Qualtrics (Qualtrics, 2018) in a classroom setting, in the presence of a teacher. A Mokken scale analysis (Sijtsma & Molenaar, 2002), an application of item response theory, was performed on the data. The results in this paper will give an overview of which (type of) items are and are not scalable on one of the three dimensions. Implications for the validity of the three assumed dimensions will be discussed.

Increasing the Flexibility of Large-Scale Assessments with Fixed Item Parameter Calibration

Keywords: Assessment methods and tools, Comparative studies, Psychometrics, Quantitative methods

Presenting Author:Christoph Koenig, Goethe University Frankfurt am Main, Germany; **Co-Author:**Lale Khorramdel, Educational Testing Service, United States; **Co-Author:**Kentaro Yamamoto, Educational Testing Service, United States; **Co-Author:**Andreas Frey, Goethe University Frankfurt am Main, Germany

Currently, it is argued that to increase the utility of international-large scale assessments for intended stakeholders it is necessary to increase their flexibility in design and implementation. In case of PISA, this is a question of how to include a larger number of tests of potential new features into its field trial, while retaining the accuracy of the preliminary IRT-based scaling and without increasing the sample size. The aim of this paper is to establish a critical for accurate item calibration in PISA by utilizing fixed item parameter calibration (FIPC) in the preliminary IRT-based scaling of PISA's field trial data. This study utilized real assessment data from ten countries of the PISA 2015 main survey, when science was the major domain: Australia, Denmark, Finland, France, Germany, Italy, Japan, Malaysia, Taipei, and the US. Multiple group IRT models utilizing FIPC were estimated in *mdltm* (von Davier, 2005) for four reduced target sample sizes (N = 125, 250, 500, 1000). Absolute bias, standard errors and fit of the resulting item parameter estimates indicate that with FIPC an accurate preliminary item calibration in PISA's field trial is possible with sample sizes as small as N = 250. Maintaining its current optimal sampling design then allows to include a larger number of tests of potential new features and improvements of the main survey. This facilitates keeping the main survey up to date with current developments in the field of Psychometrics and legitimizing the cost and effort from the perspective of the intended stakeholders.

Keynotes - PART 1 1

14 August 2019 13:45 - 15:15
Lecture Hall - H02 - Trivago Hörsaal
EARLI Keynote Session
Learning and Social Interaction

At the boundary of school: Discontinuities in students' in and out-of-school participations

Keywords: Cultural psychology, Integrated learning, Secondary data analysis, Social aspects of learning and teaching

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Äli Leijen, University of Tartu, Estonia

Students do not stop learning upon leaving the school building. Recognition for this once-novel idea stems from a long line of research on learning in contexts other than school. More recent multi-systemic research has drawn attention to students' daily participation across the contexts of school, home, work, peer groups, and leisure (institutes). Such parallel and sequential participations can be effortless, but also quite effortful – conceptualized as continuity and discontinuity in learning across contexts respectively - owing to contextual differences in purpose, meaning, and form. In the first part of the presentation, the following key findings of our synthesis of 186 empirical studies on students' learning across school and out-of-school contexts will be elaborated upon. First, continuities and discontinuities in learning across school and out-of-school contexts are not tied to specific situations, but occur within and across different subject domains, levels of education, institutions, and countries; yet, discontinuity is mainly found for non-mainstream students, with severe implications. Second, continuity can be the result of different educational intentions (designed with brokers, boundary objects and boundary interactions), but it also occurs as a given, sometimes unexpectedly. Third, some studies show how different actors, including students, deliberately seek discontinuity, challenging the widespread preference for continuity. Last, challenges for schools in connecting to out-of-school contexts include: going beyond sugarcoating; meeting existing curricular standards, especially when out-of-school experiences are contradictory; considering when and where educationalizing is still productive; and safeguarding sustainability of the initiatives with scarce resources, not in the least time. The synthesis concluded with the call for new methodological designs suitable for capturing open-ended learning within and across different contexts. In the second part of the presentation, more recent research wherein students' interest-

based participations are traced across contexts with a smartphone app that allows for such idiosyncrasy and multiplicity, will be presented.

At the boundary of school: Dis/continuities in students' in and out-of-school participations

Presenting Author:Larika Bronkhorst, Utrecht University, Netherlands

Students do not stop learning upon leaving the school building. Recognition for this once-novel idea stems from a long line of research on learning in contexts other than school. More recent multi-systemic research has drawn attention to students' daily participation across the contexts of school, home, work, peer groups, and leisure (institutes). Such parallel and sequential participations can be effortless, but also quite effortful – conceptualized as continuity and discontinuity in learning across contexts respectively - owing to contextual differences in purpose, meaning, and form. In the first part of the presentation, the following key findings of our synthesis of 186 empirical studies on students' learning across school and out-of-school contexts will be elaborated upon. First, continuities and discontinuities in learning across school and out-of-school contexts are not tied to specific situations, but occur within and across different subject domains, levels of education, institutions, and countries; yet, discontinuity is mainly found for non-mainstream students, with severe implications. Second, continuity can be the result of different educational intentions (designed with brokers, boundary objects and boundary interactions), but it also occurs as a given, sometimes unexpectedly. Third, some studies show how different actors, including students, deliberately seek discontinuity, challenging the widespread preference for continuity. Last, challenges for schools in connecting to out-of-school contexts include: going beyond sugarcoating; meeting existing curricular standards, especially when out-of-school experiences are contradictory; considering when and where educationalizing is still productive; and safeguarding sustainability of the initiatives with scarce resources, not in the least time. The synthesis concluded with the call for new methodological designs suitable for capturing open-ended learning within and across different contexts. In the second part of the presentation, more recent research wherein students' interest-based participations are traced across contexts with a smartphone app that allows for such idiosyncrasy and multiplicity, will be presented.

Keynotes - PART 1 2

14 August 2019 13:45 - 15:15

Lecture Hall - H01

EARLI Keynote Session

Teaching and Teacher Education

Research on Teaching: Content Matter, Practices, Quality and Effectiveness

Keywords: Comparative studies, Teacher Effectiveness, Teaching/instruction, Video analysis

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Wolfram Rollett, University of Education Freiburg , Germany

Understanding the nature of classroom teaching and its effects on student learning has been a key topic in the history of educational science. The challenge of educational research is to replace normative notions of "good teaching" by evidence-based theories of "successful teaching" (Berliner, 2005), developing concepts and measures of teaching that can inform teacher training, professional development, and evaluation. From an Educational Effectiveness perspective, the goal is to identify patterns of "practices" and dimensions of "quality" that are positively related to cognitive and non-cognitive student outcomes.

Unfortunately, the very nature and theoretical status of "practices" and "quality" oftentimes remain unclear. Given the complexity of classroom teaching and learning, this research needs to be grounded in a combination of: conceptualizations of teaching from various traditions, learning theories, models and measures of the subject matter taught. It also requires observational as well as survey-based measures of classroom processes. The keynote reports on a research program studying teaching effectiveness as a consequence of (a) depth of the subject matter taught, (b) use of evidence-based instructional methods, and (c) high quality enactment in the course of classroom interaction. Quality of enactment in turn comprises at least three generic dimensions of teaching quality: Classroom Management, Supportive Climate, and Cognitive Activation. This conceptual model has been widely applied in surveys and (quasi-) experimental studies across German speaking countries, while more recently it has also informed comparative research in the context of PISA and the ongoing TALIS Video Study. Findings from national and international studies will be reviewed, with a focus on mathematics and science education. Methodological challenges and open questions (such as the notion of adaptivity and the interaction of instructional methods with generic quality dimensions) will be discussed.

Research on Teaching: Content Matter, Practices, Quality and Effectiveness

Presenting Author:Eckhard Klieme, German Institute for International Educational Research (DIPF), Germany

Understanding the nature of classroom teaching and its effects on student learning has been a key topic in the history of educational science. The challenge of educational research is to replace normative notions of "good teaching" by evidence-based theories of "successful teaching" (Berliner, 2005), developing concepts and measures of teaching that can inform teacher training, professional development, and evaluation. From an Educational Effectiveness perspective, the goal is to identify patterns of "practices" and dimensions of "quality" that are positively related to cognitive and non-cognitive student outcomes.

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Keynotes - PART 1 3

14 August 2019 13:45 - 15:15

Lecture Hall - H03 - Otto Fuchs Hörsaal

EARLI Keynote Session

Cognitive Science

When Productive Failure Fails

Keywords: Educational Psychology, Instructional design, Mathematics, Problem solving

Interest group: SIG 20 - Inquiry Learning

Chairperson: Eleni Kyza, Cyprus University of Technology, Cyprus

It has been more than a decade now since the seminal paper on Productive Failure (PF) was published. Substantive work has since been carried out, not just by me but also internationally to reproduce and extend the work. While much attention has been focused on the successes of Productive Failure, especially in independent replication and extension, not as much has been said about the failures. Talking about when Productive Failure fails is as important as when it succeeds, for it is by interrogating both the conditions of success and failures that we can begin to articulate the boundary conditions of how, when, why, for whom, and under what conditions Productive Failure works. In addition to the scientific importance of such an analysis, the underlying philosophy of Productive Failure demands an attention to its own failures, with the view of learning from it.

When Productive Failure Fails

Presenting Author:Manu Kapur, ETH Zurich, Switzerland

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Session L 1

14 August 2019 15:30 - 17:00
Lecture Hall - H10
SIG Invited Symposium
Learning and Special Education

SIG 15: Antecedents and outcomes of teaching quality in inclusive classrooms

Keywords: Attitudes and beliefs, Special education, Teaching approaches, Teaching/instruction

Interest group: SIG 15 - Special Educational Needs

Chairperson: Elisabeth Moser Opitz, University of Zurich, Switzerland

Discussant: Hannu Savolainen, University of Jyväskylä, Finland

Research on teaching quality in inclusive classrooms is scarce. Whilst for regular classrooms, classroom management, cognitive activation, and student support have been shown to be important, it is often assumed that other or additional factors may be crucial in inclusive classroom: e.g. the cooperation of the regular and the special education teacher, the attitudes of teachers towards inclusion or differentiation practices. However, most of the studies which are available are cross-sectional or examine teaching quality with self-assessment of the teachers. This symposium aims to contribute to this research gap by presenting studies which tackle the topic of teaching quality in inclusive classrooms either with external assessment and/or with longitudinal data.

The first paper examines to what extent secondary school teachers differentiate their instruction according to their students and which characteristics of the teacher are related to differentiated instruction. The second paper investigates differentiation practices in inclusive classrooms in the framework of a video study and focuses on the characteristics of both, the general and special education teacher. The third paper assesses the impact of individual characteristics of students and of teaching quality on the mathematical development of students with and without intellectual disabilities. Finally, the fourth study examines the impact of co-teaching on students interactions and their academic achievement.

We aim to discuss if the results of the studies are a function of the studies' designs or if the patterns of results can be attributed to other aspects which would impose further research questions.

Differentiation in Secondary School – Do teachers' attitudes and self-efficacy beliefs matter?

Presenting Author: Susanne Schwab, University of Vienna, Austria; **Co-Author:** Lisa Hoffmann, University of Wuppertal, Germany; **Co-Author:** Umesh Sharma, Monash University, Australia

The question of successful conditions for teaching in heterogeneous classes is increasingly in focus. Differentiation is repeatedly cited as the basis for inclusive teaching approaches (e.g. Feyrer & Altrichter, 2018). The study's major aim is to examine the psychometric properties of a newly developed scale of inclusive teaching practices. In addition, the question arises to what extent German, Mathematics and English teachers (secondary school) differentiate their instruction. Further the question is raised which variables on teachers' level (work experience, attitudes towards inclusive schooling, self-efficacy beliefs) influence teachers use of inclusive practices. Seven hundred and one students from 41 classes of different school types of the 5th - 9th grade in North Rhine-Westphalia were asked to assess the teaching of their teachers by means of the newly developed "Inclusive Teaching Practices Scale". Two main subject teachers for each class were asked to complete the teacher version of this scale. The results of factor analyses showed that the items loaded on two factors (personalization and differentiation). Interaction of possible influencing factors at teacher level (e.g. subjects taught, attitudes and self-efficacy beliefs) were examined. Analyses of variance showed that mathematics teachers personalize more than German teachers do. The results of the multi-level regression analyses revealed that teachers with longer teaching experience focus teaching more closely to the personal needs of students. Furthermore, teachers applied differentiation in classes if they had a positive attitude towards inclusion.

Differentiation in Inclusive Classrooms - Results of a Video Study

Presenting Author: Elisabeth Moser Opitz, University of Zurich, Switzerland; **Co-Author:** Helena Krähenmann, University of Zurich, Switzerland; **Co-Author:** Sarah Jandl, University of Teacher Education Zurich, Switzerland; **Co-Author:** Franziska Felder, University of Zurich, Switzerland; **Co-Author:** Rachel Sermier Dessemontet, University of Teacher Education Vaud, Switzerland

Research on teaching quality in inclusive classrooms is scarce. One reason is the challenge of „nested instruction“. In inclusive classrooms, a general education teacher (GET) and a special education teacher (SET) are present for some lessons per week in different forms of co-teaching or the SET teaches students with special educational needs (SEN) in a separate room. In such settings, it is very difficult to attribute outcomes (e.g. teaching quality, achievement gains) to the teachers as they both influence the teaching processes. The video study aimed to tackle the challenge of nested instruction by focusing on both, individual variables of GET and SET, and variables which are influenced by both teachers (differentiation and cooperation). The study was carried out in 34 inclusive classes in grade 2 and 3. Each class was attended by at least one student with intellectual disability (ID). It was investigated (hierarchical regression analysis) if there is an impact of the attitudes towards inclusion of the GET, the professional mathematical knowledge of the SET and the satisfaction with collaboration of both teachers (questionnaires) on differentiation practices (video data). The results revealed an impact of the professional mathematical knowledge of the SET on the differentiation practices. Contrary to the assumptions, no impact of the attitudes towards inclusion of the GET and the satisfaction with the collaboration was found. Conclusions for further research how to tackle the challenge of nested instruction and limitations of the study will be discussed.

What matters for the Learning Gains of Students in Inclusive Classrooms?

Presenting Author: Elisabeth Moser Opitz, University of Zurich, Switzerland; **Co-Author:** Helena Krähenmann, University of Zurich, Switzerland; **Co-Author:** Sarah Jandl, University of Teacher Education Zurich, Switzerland; **Co-Author:** Franziska Felder, University of Zurich, Switzerland; **Co-Author:** Susanne Schnepel, University of Zurich, Switzerland; **Co-Author:** Rachel Sermier Dessemontet, University of Teacher Education Vaud, Switzerland

Research has revealed that teaching quality (classroom management, cognitive activation, student support) are crucial factors for the learning gains of students. For inclusive classrooms, it is assumed that additional factors could be important. For instance, the collaboration of the general education teacher (GET) and the special education teacher (SET), the GETs' attitudes towards inclusion, or the number of hours a SET is present in the classroom. In this study, the impact of individual characteristics of students (prior mathematical skills, IQ, gender) and of teaching quality (classroom management, attitudes towards inclusion of the GET, professional mathematical knowledge of the SET, satisfaction with the collaboration of GET and SET, the number of hours of support of the SET) on the mathematical development of students with and without intellectual disabilities (ID) was investigated. The study was carried out in 31 inclusive classrooms (N = 488) in grades 1 to 3. Each class was attended at least by one student with ID (n = 43). To answer the research questions, multilevel analysis was carried out with the sample of students without ID (n = 445) and regression analyses with the sample of the students with ID. Results revealed for both samples an impact of individual characteristics (IQ, mathematical achievement at t1) on the mathematical development. Looking at the teaching quality, only the number of hours a SET was present in the class had a significant impact on the learning gains of the students in the sample of the students without ID.

Is there a dark side of co-teaching? Relations of co-teaching and students' academic achievement

Presenting Author: Thorsten Henke, Leibniz University Hannover, Germany; **Co-Author:** Nadine Spörer, University of Potsdam, Germany; **Co-Author:** Stefanie Bosse, University of Potsdam, Germany

With regard to the heterogeneity of students in inclusive classes, it is recommended to instruct students by more than one teacher. Drawing on that

recommendation, the main aim of the present study was to investigate how student-student and teacher-student interactions were influenced by the implementation of co-teaching in inclusive primary school classes. Further, the impact of co-teaching on the achievement of students with and without SEN was analyzed. $N = 246$ students who learned in ten inclusive primary schools classes were observed in math and German lessons at three measurement occasions. Students' achievement was assessed with standardized reading comprehension and mathematics tests. Applying Bayesian sequential logit analyses, a significant moderator effect of co-teaching \times SEN on student-student and teacher-student interactions occurred in the domain of math but not in the domain of German. In co-taught math lessons, students with SEN interacted more with classmates and teachers compared to lessons without co-teaching and compared to students without SEN. Further, in terms of math achievement students with and without SEN did not profit from co-teaching or increased student-student interactions. Results are discussed with regard to intended and unintended effects of co-teaching.

Session L 2

14 August 2019 15:30 - 17:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Assessment and Evaluation, Cognitive Science

Analyzing trace data as an approach for the investigation of central processes of reading

Keywords: Cognitive skills, Competencies, Comprehension of text and graphics, Higher education, Metacognition, Reading comprehension, Secondary education, Student learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 27 - Online Measures of Learning Processes

Chairperson: Carolin Hahnel, Germany

Organiser: Cornelia Schoor, University of Bamberg, Germany

Organiser: Carolin Hahnel, Germany

Discussant: Philip Winne, Simon Fraser University, Canada

The study of reading processes provides fruitful information about the abilities of readers and how they approach and use different texts. It can inform both theory and practice about how written information is retrieved, processed, used and communicated. To make reading processes visible, process data are often used under the assumption that conclusions can be drawn about underlying psychological processes. As a specific type of process data, trace data describe event-based data collected "on the fly" using technology-based assessments, which can include reading times or interactions between readers and reading environments (e.g., frequencies and sequences of visits to texts). This symposium brings together four studies that examine processes of reading and learning from text with the aid of trace data. The first contribution analyzes changes in reading behavior that result from restrictions in students' navigation between texts and tasks. The second contribution uses trace data to infer on strategies of corroboration and sourcing that are investigated in terms of how students deal with multiple documents. The third contribution examines the time that students devote to reading and selecting titles of documents as a sign of task-oriented reading and deep elaboration on content. The last contribution focuses on students' creation and use of text snippets and investigates how students extract ideas from multiple online sources in order to write an informed argumentation. The contributions will be discussed with regard to the different ways in which trace data can be utilized and interpreted to infer on psychological processes of reading.

Strategic processing of a reading comprehension test: trace data on the allocation of study time

Presenting Author: Ilka Wolter, Leibniz Institute for Educational Trajectories (LifBi), Germany; **Co-Author:** Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany

Adjusting learning behavior to the requirements of learning material is a central element of strategic processing which implies that learners have a repertoire of strategies at their disposal and are able to detect the relevant cues and features of the task to select them. However, previous research on procedural metacognition indicates that such calibration processes do not necessarily require conscious processing. Yet, allocation of study time (as an indicator of metacognition) has often been found to be associated with higher performance. In a computer-based reading competence assessment we wanted to test whether indications of strategic calibration behavior (allocation of study time) can be corroborated when the access to texts is limited during the test. In the experimental group with limited access, we hypothesized that items are more difficult and that individuals – especially with high reading competence – adapt their initial reading behavior because they are not allowed to switch back to the text when solving the tasks. $N=891$ adults (20-70 years) from a pilot study of the German National Educational Panel Study (NEPS) were randomly assigned to either of the two experimental conditions in six out of 18 texts. Findings revealed equal item difficulties in both test conditions. The regression model confirmed that competent readers showed longer initial reading times when they had limited access to texts compared to the control group with unlimited access. Less competent readers only slightly adapted their reading times. The discussion will highlight the potential of log-data to examine processing strategies in a computer-based assessment.

Processes of multiple document comprehension and their relationship to test performance

Presenting Author: Cornelia Schoor, University of Bamberg, Germany; **Co-Author:** Carolin Hahnel, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:** Nina Mahlow, Leibniz Institute for Educational Trajectories (LifBi), Germany; **Co-Author:** Ulf Kroehne, DIPF, Germany; **Co-Author:** Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:** Cordula Artelt, Leibniz Institute for Educational Trajectories, Germany

In order to adequately process information from multiple documents, students must be able to integrate information across documents and relate this information to their sources (Documents Model Framework, e.g. Britt & Rouet, 2012). It has been observed that skilled comprehenders apply strategies of corroborating (comparing information across texts), sourcing (paying attention to the source), and contextualization (connecting the documents with prior knowledge) (Wineburg, 1991). So far, there is only scarce research linking these strategies to trace data. Trace data provide the potential to unobtrusively and economically observe behavior and infer such strategies as they unfold over time. The present study aims at examining strategies that are related to multiple document comprehension (MDC) by means of trace data. The participants were $N=310$ university students who completed three units of a computer-based MDC test. Based on the log-data, indicators for corroboration and sourcing were derived, for which it was hypothesized that students with a better MDC perform them more frequently. Moreover, other behaviors were considered exploratorily in comparison (e.g., time on task, time on texts). Taking the hierarchical data structure into account, it was found by means of linear mixed models that MDC was positively associated with corroboration and sourcing, but that it was not significantly related to time on task or time on texts. Results on time- and sequence-related analyses will be presented at the conference. The present results speak in favor of the postulated strategies of corroboration and sourcing and that they can be researched by means of trace data.

Impact of selective and general task instructions in multiple documents reading

Presenting Author: Raquel Cerdan, University of Valencia, Spain; **Co-Author:** Carmen Marín, University of Valencia, Spain

This study analyzed the impact of selective and general task instructions on the processing of multiple conflicting documents. 61 high-school students were presented with four documents that varied in their position on the topic and level of trustworthiness. Students were instructed to read the texts to write an argument essay task. Half of the students were asked to use information from two of the four documents that were available (*selective instruction*), in contrast to a general instruction to read (*general instruction*). Reading time indicators of the different documents as well as content information in the essays were analyzed. As predicted, a selective task instruction made students focus on trustworthy documents which were inconsistent with their previous beliefs. The results are interpreted in accordance with models explaining how readers deal with inconsistent information in multiple documents (Richter & Maier, 2017).

Investigating sixth graders' selection and use of main ideas from multiple online texts

Presenting Author: Carita Kiili, University of Oslo, Norway; **Co-Author:** Nina Kullberg, University of Jyväskylä, Finland; **Co-Author:** Ivar Bråten, University of Oslo, Norway; **Co-Author:** Roberto González-Ibáñez, University of Santiago, Chile; **Co-Author:** Paavo H. T. Leppänen, University of Jyväskylä, Finland

This study examined how well students were able to select relevant ideas from online texts with a snippet selection tool and how they used these selections in

their written products. Participants were 179 sixth graders with a mean age of 12.13 (SD=0.41) years. The students completed an online reading task with a computer-based program where they were asked to write an article to a school magazine about advantages and disadvantages of computer gaming. The students read three online texts that presented different perspectives on computer gaming and selected two snippets (maximum 20 words) from each text and, finally, wrote their article with the selected snippets available. Additionally, students' reading fluency and reading comprehension were measured. The data consist of students' snippet selections and the written products. We began the analysis of the snippets by identifying all different snippets (n=159) that students had selected from the three texts. Each of these snippets was scored from 0 to 2 points according to their relevance for completing the task. The results showed that selecting relevant ideas with a snippet tool was quite easy for students. Participants' average score based on all six snippets was 10.58 points (SD=1.64). Moreover, the snippet score correlated with reading fluency ($r_s=0.215$; p

Session L 3

14 August 2019 15:30 - 17:00

Lecture Hall - H11

Symposium

Higher Education

Reconsidering the concept of social integration in the first year of higher education

Keywords: Achievement, Communities of learners, Higher education, Mixed-method research, Qualitative methods, Social aspects of learning and teaching, Social interaction

Interest group: SIG 04 - Higher Education

Chairperson: Vincent Donche, University of Antwerp, Belgium

Organiser: Vincent Donche, University of Antwerp, Belgium

Organiser: Jonas Willems, University of Antwerp, Belgium

Discussant: Mariane Frenay, Université catholique de Louvain (UCL), Belgium

Literature on the first year of higher education underlines that many students experience a 'transition shock' when encountering their new learning environments and demands to adjust one's self. Understanding the first-year experience is essential to be able to effectively guide and support students in their transition to higher education. One prominent factor in the research on the transition to higher education is the social integration process. However, despite the substantial amount of (predominantly quantitative) research on the construct of social integration, this concept is rarely discussed in detail and the different factors of this process remain elusive. To date, there has been little agreement on the definition and operationalisation of the social integration construct across studies. Furthermore, the nature of the relationship between social integration and study success is unclear. Therefore, this symposium aims to deepen the current understanding on how students experience the social integration process and to what extent this has an impact on different measures of student success. Hereto, four contributions were brought together in this symposium that focus on social integration, using a diversity of approaches: qualitative, quantitative and mixed method.

Examining social integration in the first year of higher education: a mixed-method approach

Presenting Author:Elke Bosse, University of Hamburg, Germany; **Co-Author:**Carla Bohndick, University of Hamburg, Germany; **Co-Author:**Vanessa Jaensch, University of Hamburg, Germany

For investigating the impact of the transition to higher education on study success, research often draws on Tinto's interactional framework of academic and social integration. While the existing research mainly uses either quantitative or qualitative methods, the present study follows the rationale of mixed methods research in order to gain a more complete understanding of how social integration is related to other first-year requirements and to study success. Guided by the findings of an interview study (N=19) we generated hypotheses for closer examining the quantitative data of a student survey (N=1,371) on the first-year requirements in higher education. In particular, we examined the hypotheses that social integration may not be directly related to study success, but rather compensates difficulties in coping with other first-year requirements (e.g. to adjust to the academic mode). First findings of regression analyses indicate moderate relationships between social integration and other first-year requirements, yet they reveal no compensation effects of social integration with regard to study success. As the interview data further suggest that social integration and study success are associated with selected student characteristics, additional analyses are supposed to explore potential differential effects in the quantitative data. After combining the qualitative and quantitative results, the discussion will address methodological challenges of mixed methods research as well as practical implications of the findings.

A network perspective on social integration and achievement in learning communities

Presenting Author:Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Andreas Flache, University of Groningen, Netherlands; **Co-Author:**Ellen Jansen, University of Groningen, Netherlands; **Co-Author:**Adriaan Hofman, University of Groningen, Netherlands; **Co-Author:**Christian Steglich, University of Groningen, Netherlands

In learning communities students share knowledge which is assumed to contribute to peer network formation and to academic achievement. This research investigated how LCs contribute to social integration (i.e., peer network formation) and to academic achievement during the first year. Social network data were collected at two time points from 95 university students in eight learning communities. The results showed that students are more likely to ask friends for academic support and vice versa. The higher a student achieves, the more often the student is selected as an academic helper or as a friend and the more often this higher achieving student initiate academic help and friendship relationships. We did not find evidence that these peer relationships influence academic achievement.

A longitudinal investigation of students' social requirements in the first year at the university

Presenting Author:Mikaël De Clercq, Université catholique de Louvain (UCL), Belgium

Based on academic requirements taxonomy, this study analyzed the role of social requirements on important factors in the adjustment process to university (self-efficacy, engagement, courses' value,...). Social requirements are divided into three dimensions: the perception of the social climate, the quality of the relationship with students and the quality of the relationship with teachers. Path analyses were carried out on 1,298 freshmen. The preliminary results highlighted that (1) the perception of the social climate is related to students' self-efficacy and socioeconomic status; (2) the relationship with teachers determined further behavioral engagement; (3) the relationship with peers determined further courses' value. The relationship between social requirements and achievement (GPA after the first and second semester) is still under investigation. We discuss the implications and limitations of this new perspective at the end of the presentation.

Important factors of the social integration process of first-year university college students

Presenting Author:Jonas Willems, University of Antwerp, Belgium; **Co-Author:**Liesje Coertjens, Université catholique de Louvain (UCL), Belgium; **Co-Author:**Vincent Donche, University of Antwerp, Belgium

The social integration process is a prominent factor in the literature on the transition to higher education. Despite the substantial body of (predominantly quantitative) research on the construct of social integration, this concept is rarely discussed in detail and the different facets of this process remain elusive. Moreover, we observe that, to date, there has been little agreement on the definition and operationalisation of the social integration construct across studies. Therefore this qualitative study explores what first-year university college students perceive to be the most important factors that social integration encompasses in the first semester of the first year of higher education. Hereto, 104 freshmen completed "reflective logs" at the start of the second semester of FYHE (February 2018) in which they were asked to describe three social experiences that they perceived to be critical (positive or negative) in the first semester. The respondents also had to situate these experiences on a timeline. Results show that students report on five overarching themes: (1) Fear of the unknown; (2) first connection with peers; (3) Deeper connection (friendship) with peers; (4) Peer support in various areas; (5) Feelings of loneliness. Further analysis suggests that these different facets of social integration are more important at different points in the first semester of the academic year, and also underscores the

process-based nature of the social integration construct. Furthermore, the association between the aforementioned facets of social integration and various non-traditional measures of student success (social self-efficacy, stress and general well-being) will be explored.

Session L 4

14 August 2019 15:30 - 17:00

Lecture Hall - H07

Symposium

Learning and Social Interaction, Learning and Special Education, Teaching and Teacher Education

Teaching to/about diversity: teaching and teacher education

Keywords: Attitudes and beliefs, Collaborative Learning, Cultural diversity in school, Early childhood education, Educational Psychology, In-service teacher education, Multicultural education, Pre-service teacher education, Primary education, Qualitative methods, Reflection, Social aspects of learning and teaching, Social interaction, Special education, Teacher professional development

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 25 - Educational Theory

Chairperson: Jo Lunn Brownlee, Queensland University of Technology, Australia

Discussant: Florian Feucht, United States

International research shows that teachers, especially graduate teachers, feel under-prepared to work with the full range of learners who comprise the contemporary school classroom. However, to date, little research has focussed on how to respond to these challenges. This symposium takes an international perspective by exploring teaching to/about diversity in teacher education programs, teacher professional learning and teaching practices. The first paper explores a new framework that focuses on how teacher educators engage in epistemically reflexive decision making related to teaching to/about diversity in teacher education programs. The next paper identifies enablements and constraints experienced by Australian teacher educators in the context of decision making related to teaching to/about diversity in teacher education[1]. This is followed by a paper which explores how Dutch teachers can be supported to teach to/about diversity through professional experiences in their classrooms that focus on partnering with other professionals. The final paper is an examination of teaching to/about diversity through the lens of the politics of belonging with a particular focus on teaching practices in long day care centres in Norway. Together these papers provide an international framing for exploring both teacher educators' and teachers' experiences of teaching to/about diversity, their capacities to understand and select pedagogies associated with quality teaching for diverse learners and how this influences students' educational and social outcomes.

[1] The first 2 papers emerge from 2015 EARLI Advanced Study Colloquia funding.

3R-EC Framework for teacher educator reflexivity about teaching to/about diversity

Presenting Author: Jo Lunn Brownlee, Queensland University of Technology, Australia; **Co-Author:** Susan Walker, Queensland University of Technology, Australia; **Co-Author:** Leonie Rowan, Griffith University, Australia

There is growing international concern about the extent to which teachers are prepared to work with an increasingly diverse student (and community) population. To date, research into the relationship between teacher preparation and preparedness to teach diverse learners has not focused on teacher educators' understandings about teaching to/about diversity. Such understandings can be informed by epistemic aspects of professional work. Epistemic cognitions (cognitions about knowledge and knowing) allow professionals to generate perspectives necessary to tackle new and old challenges. The social lab reported in this presentation investigated 12 Australian teacher educators' perspectives about teaching to/about diversity using the 3R-Epistemic Cognition (EC) framework. The findings showed that the 3R-EC framework could be useful for capturing epistemic reflexive dialogues about teaching to/about diversity, although some aspects of the framework were identified by the teacher educators as challenging. On the basis of these identified challenges, refinements concerning communication and use of the 3R-EC framework were identified. The feedback also led to some refinements of the social lab methodology for use in the larger national study.

Enablements and constraints experienced by teacher educators when teaching to/about diversity

Presenting Author: Mary Ryan, Macquarie University, Australia; **Co-Author:** Terri Bourke, Queensland University of Technology (QUT), Australia

The recasting of teaching as a technical enterprise rather than as a space for intelligent problem-solving means that governments around the world will continue to pursue agendas to regulate and prescribe teacher education. Teacher education reform has been attempted for over 30 years in many countries around the world, yet the crucial priority of preparing teachers for increasingly diverse classrooms has not been addressed. We used the concept of epistemic reflexivity and an innovative social lab methodology to investigate the conditions of teacher education experienced by 12 teacher educators at a metropolitan university in Australia. Personal, structural and cultural emergent properties were evident and were experienced variously as both enablements and constraints. Our findings show that these teacher educators were more constrained than enabled in teaching to diversity. We argue that teacher educators need to form deep and enduring inquiry relationships with schools and communities in order to develop context specific solutions to address the complexities of teaching to diversity.

Belonging in the classroom: Partnering for Change (P4C)

Presenting Author: Sarah Meuser, Zuyd University of Applied Sciences, Netherlands; **Co-Author:** Barbara Piskur, Zuyd University of Applied Sciences, Netherlands

The introduction of inclusive education into mainstream education has increased diversity within classrooms. This has presented challenges for teachers (lack of support, skills and time), school principals (changes in school structure and culture), and children with special needs (difficulties in performing motoric tasks, behavioural problems) and highlights the need for professional development. Building educators' capacity through cross-collaboration in an integrated approach is regarded as the way forward to enhance inclusive education. The effective Canadian approach, Partnering for Change (P4C) stands out as a best practice in the scientific literature. This intervention focusses on cross-collaboration between educator and occupational therapist in the classroom (co-teaching) in order to increase educator capacity. This paper details a pilot study conducted to gain insight into preliminary experiences of educators and occupational therapists using the P4C Model in the Dutch setting. Individual face-to-face semi-structured interviews with educators and occupational therapists were used to gather data and content analysis performed. Results are presented in four major themes, (1) strategies, (2) environmental challenges, (3) successes and (4) future needs. Findings indicated positive experiences were reported by both teachers and occupational therapists and that the intervention shows promise for use in the Dutch context.

Politics of belonging: processes of inclusion and exclusion in educational settings

Presenting Author: Anita Berge, University of Stavanger, Norway; **Co-Author:** Eva Marianne Johansson, University of Stavanger, Faculty of Arts and Education, Norway

As diversity in classrooms increases, there is a growing concern about children's exclusion, especially for those with individual needs and minority cultural and linguistic backgrounds. Preventing children's exclusion and enhancing their belonging have become major policy agendas worldwide, and there is an increased need to understand how early childhood educators teach to/about diversity. This study aims to advance knowledge about the politics of belonging in Norwegian preschools by exploring the following research question: How do educators experience and interpret the politics of belonging in their educational setting? Eighteen educators from three Norwegian day-care centres were interviewed in small groups at each centre to examine their experiences of processes for belonging, inclusion and exclusion on the basis of diverse groups of children. Preliminary findings featured how educators encountered various dilemmas when addressing issues of belonging and exclusion in preschool. This study has implications for educational policies and practices beyond the research context, including informing teacher education programs.

Session L 5

14 August 2019 15:30 - 17:00

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Motivational, Social and Affective Processes

Defining and measuring curiosity in the context of learning and scientific practices

Keywords: Assessment methods and tools, Attitudes and beliefs, Early childhood education, Inquiry learning, Learning approaches, Mixed-method research, Motivation and emotion, Psychometrics, Science education, Teaching/instruction

Interest group:

Chairperson: Tessa van Schijndel, University of Amsterdam, Netherlands

Organiser: Tessa van Schijndel, University of Amsterdam, Netherlands

Discussant: Susanne Koerber, University of Education Freiburg, Germany

Curiosity plays a fundamental role in human development, and in educational and scientific discovery (Kashdan & Silvia, 2009). In the field of science education, curiosity is considered an indispensable drive for learning. Although curiosity is widely acknowledged as the core of intrinsically motivated actions (Raine et al., 2002), its study has suffered from scholarly ambivalence because of conflicting conceptualization (Reio Jr et al., 2006). This symposium includes international, interdisciplinary perspectives on a) defining curiosity, b) techniques for measurement, and c) the relation between curiosity and science education practices, from student and teacher perspectives. We focus on the type of curiosity that is driven by information gaps (Loewenstein, 1994; Litman, 2005), or the desire to seek out unknown information. This curiosity manifests as information seeking behavior (Litman, 2005; 2008), a desire to understand and quest for knowledge (Krapp & Prenzel, 2011), which is most relevant for science learning. The first two papers present novel approaches for assessing curiosity in preschool and primary years, rather than self- or teacher-report. In the first, children indicate preferences for dot-to-dot drawings to complete across different uncertainty levels, and the second includes a set of ecologically-valid scientific educational experiences to assess curiosity. The third paper examines the relation between curiosity and student learning behaviours, while the fourth paper focuses on teachers' curiosity-promoting instruction. Interactive elements of the symposium include audience participation in (curiosity) item construction and analysis of young children's behaviours and verbalisations, and a discussion on how curiosity research can inform educational practice.

A novel approach to the assessment of curiosity

Presenting Author:Brenda Jansen, University of Amsterdam, Netherlands; **Co-Author:**Tycho Dekkers, University of Amsterdam, Netherlands; **Co-Author:**Tessa van Schijndel, University of Amsterdam, Netherlands

The general consensus is that a curious mind is essential for learning, or at the very least facilitates learning. The assessment of curiosity is however challenging. The limited number of psychometrically acceptable instruments for children contrasts sharply with the importance attached to the concept. In this presentation, the concept of curiosity is analysed, operationalized, and tested. The selected operationalization centres around the concept of deprivation curiosity and resulted in the Connect the Dots task (CTD task). In interaction with the audience, I will go through the process of item construction of the task. The task was administered to children (6-12 years) from an extensive sample (N = 328), and administered again after three months in a sub-sample (N = 220). The Connect the Dots task proved to be an asset to the important research into curiosity: it has sufficient test-retest reliability, good internal consistency and correlates with curiosity ratings, intelligence, and school achievement.

Measuring Preschooler's Curiosity by a Set of Integrated Scientific Educational Experiences

Presenting Author:Ornit Spektor-Levy, Bar-Ilan University, Israel; **Co-Author:**Yael Kesner Baruch, Levinsky College of Education, Tel Aviv, Israel, Israel; **Co-Author:**Zemira Mevarech, Bar-Ilan University, Israel

Despite the importance of curiosity and its application to education, studies using operational definitions and empirical measurements are relatively scarce, especially with young children. In this study we sought to examine the different aspects of curiosity among young children from an ethological and ecologically validated perspective. Based on this approach, a set of scientific educational experiences—the Integrated Science Engagement Responsive Tasks (ISERT)—was developed to examine preschoolers' (N=64; M=64-months-old, SD=8.3) responses as potential indications of scientific curiosity. The ISERT consists of three parts: Puppet Interview, Active Exploration, Scientific Demonstration. Children's verbal and behavioral responses gathered through the ISERT (according to 45 indicators) were analyzed through video microanalysis and a detailed scoring scheme and found to comprise three aspects: cognitive, emotional, and sensorimotor. The array of tools included in the ISERT and the large number of indications extracted from it may provide measurable indicators of scientific curiosity in preschool children. Since this set of tools was designed to study curiosity in its ethological context, through scientific educational experiences, it may be used by educators as means to learn about the individual child and how to support and nurture his/hers scientific curiosity. As part of the symposium presentation, the audience will take part in short interactive session: analyzing young children's behaviours and verbal elaborations, documented through the ISERT.

Curiosity and Inquiry-Based Learning

Presenting Author:Tessa van Schijndel, University of Amsterdam, Netherlands; **Co-Author:**Brenda Jansen, University of Amsterdam, Netherlands; **Co-Author:**Maartje Raijmakers, University of Amsterdam, Netherlands

Curiosity is seen as an important motivator for learning in science education. In this study, we investigated how children's curiosity relates to their inquiry-learning process and outcomes, in inquiry-learning environments differing in structure. The focus on curiosity was not only motivated by the importance of curiosity in science education, but also by the theoretical relation between curiosity and inquiry. That is, uncertainty is considered central to both the definition of curiosity and the inquiry-learning environment. Curiosity was assessed with the Underwater Exploration game (Jirout & Klahr, 2012). Structure of the inquiry-learning environment was manipulated by explaining this principle or not. As intelligence relates to learning and possibly curiosity, it was taken into account. Results showed that children's curiosity was positively related to their knowledge acquisition, but not to their quality of exploration. For low intelligent children, environment structure positively affected their quality of exploration, but not their knowledge acquisition. There was no interaction between curiosity and environment structure. These results support the existence of two distinct inquiry-based learning processes – the designing of experiments, on the one hand, and the reflection on performed experiments, on the other – and link children's curiosity to the latter process. A discussion with the audience will explore designs for future research investigating the hypothesis that curiosity is related to better reflection on experimentation.

The importance of curiosity in the classroom: Methods of studying curiosity across contexts

Presenting Author:Sharon Zumbrunn, Virginia Commonwealth University, United States; **Co-Author:**Jamie Jirout, University of Virginia, United States; **Co-Author:**Virginia Vitiello, University of Virginia, United States

Children do not associate school with curiosity (Post & Walma van der Molen, n.d.), and show much lower rates of curiosity within classroom contexts (Tizard & Hughes, 1984), despite its value in promoting motivation and learning (Chin & Brown, 2002). Research on curiosity in learning and education has been limited in being studied in either lab settings or classroom contexts. This talk will discuss methods of implementing what is known from research in education and psychology to assess whether curiosity can be promoted in classroom contexts. We will describe a project including both a lab-based experiment and classroom observations to test the same framework of curiosity-promoting instruction. We will present data that show that promoting curiosity can lead to higher rates of question asking, and discuss what this looks like in classroom instruction for math and science. Although there is reason to believe that the rate of student curiosity is increasing and teachers make greater efforts to encourage questions compared to prior studies (Eshach, Dor-Ziderman, & Yefroimsky, 2014), the current results suggest that this type of encouragement is not typically happening, at least in preschool classrooms. This presentation will end with a discussion about how research can help to address this challenge.

Session L 6

14 August 2019 15:30 - 17:00

Lecture Hall - H08

Symposium

Higher Education

Epistemic change from multiple perspectives

Keywords: Argumentation, Attitudes and beliefs, Case studies, Cognitive development, Conceptual change, Developmental processes, Experimental studies, Higher education, Reasoning, Teacher professional development

Interest group:

Chairperson: Tom Rosman, Germany

Chairperson: Eric Klopp, Saarland University, Germany

Discussant: Ivar Bråten, University of Oslo, Norway

Epistemic beliefs are vital for scientific thinking and argumentation. Thus, knowledge about the change towards more advanced epistemic beliefs is of utmost importance for higher education research. The symposium is intended to investigate the topic of epistemic change from multiple perspectives. In this context, multiple perspectives refer to epistemic change investigated by means of different research settings and different methodological approaches. Its goal is to bring together research on epistemic change to synthesize the current research, and especially to gain new insights into the prerequisites and the process of epistemic change. The first contribution investigates the development of psychology students' epistemic beliefs in six different European countries from the beginning to the end of their second semester. The second contribution describes two in-depth cases-studies investigating the epistemic development of two pre-service teachers from their first year in teacher education until the first year after graduation. The third contribution is an experimental study on the effects of presenting resolvable and non-resolvable scientific controversies to elicit epistemic change in psychology students. The fourth contribution also uses an experimental design and compares the effects of resolvable controversies and a direct instruction on the change in epistemic beliefs and argumentation skills of psychology students. Finally, a renowned researcher in the field of epistemic beliefs discusses the contributions.

Epistemic Change in the First Year of Studying Psychology in Six European Countries

Presenting Author: Peter Edelsbrunner, ETH Zurich, Switzerland; **Co-Author:** Nina Vaupotič, University of Münster, Germany

During their studies, future practitioners and researchers in the field of psychology are expected to gain an understanding of how psychological knowledge is produced. We examined how epistemic cognition along the three dimensions of belief in simple and certain knowledge, belief in justification by authority, and belief in personal justification changes in the course of the second semester of undergraduate studies in psychology, and which personal predictors might account for such change. 519 students from six different countries were assessed in the beginning and in the end of their second semester. Results indicate significant decrease in understanding psychological knowledge as simple and certain in all countries. No significant change was found for the belief in authority and self as justification for knowledge, however with some differences across countries. The predictor variables need for cognition, science self-efficacy and research aspirations were not able to explain any epistemic change. In a clustering analysis (latent profile analysis) three different patterns of beliefs emerged, with some students changing from a less sophisticated to a more sophisticated pattern during the course of the semester. These results indicate that some epistemic change can take place even within just one semester in the first year of higher formal education, however the investigated predictor variables were not able to account for this change. We discuss implications of these findings for theories about epistemic change and the role of higher education.

Case studies of (pre-service) teachers' changing epistemic cognition

Presenting Author: Leila Ferguson, Kristiania University College, Norway

(Pre-service) teachers' epistemic cognition influences their learning and (future) teaching, for example, by filtering the sources of knowledge that they choose to engage with, framing their view of learning tasks, and guiding their views of teaching. Epistemic change in (pre-service) teachers is, however, poorly understood. Moreover, there is a need for longitudinal research on how (pre-service) teachers' epistemic cognition changes during and after teacher education programs, including descriptions of signs of mechanisms of epistemic change, identifying change in different dimensions of epistemic cognition and what this means for (pre-service) teachers learning and teaching, as well as suggestions for how to facilitate such change in teacher education. This study provides insights into changes in two (pre-service) teachers' epistemic cognition during teacher education and in their second year of employment, as well as implications for their practice and for teacher education programs.

Does resolving conflicting scientific claims lead to more nuanced views on science?

Presenting Author: Tom Rosman, Leibniz Institute for Psychology Information, Germany; **Co-Author:** Martin Kerwer, Leibniz-Institute for Psychology Information (ZPID), Germany

In past intervention studies, our work group repeatedly found that confronting students with conflicting scientific claims that may be integrated by identifying moderating factors ('resolvable controversies') leads to more advanced epistemic beliefs (i.e., more nuanced views on scientific knowledge). In the present study, we extended this line of research by contrasting resolvable and unresolvable controversies and by testing the effects of writing instructions on epistemic belief change. For this reason, a study using a randomized pre-post design with four experimental groups was carried out. Experimental groups differed in the kind of conflicting claims included: Students either read (1) information on students applying learning strategies (control), (2) unresolvable, or (3a) resolvable controversial information on gender stereotyping. In the latter condition (3b), an additional group of participants deliberately resolved apparent contradictions in a writing task. $N = 185$ psychology students participated in the study. While differences in epistemic change between the control group and the experimental groups were found (using a slightly different methodological approach than in our past intervention studies), effects in the treatment groups did not differ significantly depending on the resolvability of presented controversies or for the group which was instructed explicitly to integrate controversial findings. In conclusion and contrary to our expectations, diverging information thus seems to foster advanced epistemic beliefs regardless of the resolvability of presented information. We therefore may need to reconsider our understanding on how individuals acquire and retain evaluativistic beliefs and the role that non-resolvable controversial information might play in this development.

Indirect and direct interventions to foster epistemic change and argumentation

Presenting Author: Eric Klopp, Saarland University, Germany; **Co-Author:** Robin Stark, Saarland University, Germany

Epistemic beliefs are a major prerequisite for scientific thinking and argumentation. Especially evaluatorist epistemic beliefs are beneficial for an adequate scientific argumentation. Thus, evaluatorist epistemic beliefs should be fostered. This study examines the effects of two intervention approaches, the indirect and the direct approach, on the change in epistemic beliefs and the argumentation of psychology students. In the indirect approach, participants are confronted with resolvable scientific controversies intended to elicit epistemic change. The direct approach draws on instructional principles and provides participants instructions on epistemic beliefs theories and encourages them to reflect their own epistemic beliefs and thus induces epistemic change. This study compares the effects of these two approaches on epistemic change and the level of psychology students' argumentation. We assume that both interventions reduce absolutism and multiplicity and foster evaluatorism as well as argumentation. In an experimental pre-post-test-design, we investigated the effects of both intervention approaches. Regarding the change of epistemic beliefs, the results indicate that only the indirect intervention reduces multiplicitist epistemic beliefs but at the same time increasing absolutism, so there is evidence for a backfire-effect. Regarding argumentation, the results indicate that both interventions increase the participants' argumentation level. The implications of our findings for theory and practice will be discussed.

Session L 7

14 August 2019 15:30 - 17:00

Lecture Hall - H09

Classroom behavior and its relation to student motivation and engagement

Keywords: Collaborative Learning, Mixed-method research, Motivation, Motivation and emotion, Secondary education, Video analysis

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Jennifer Symonds, University College Dublin, Ireland

Organiser: Maximilian Knogler, Germany

Organiser: Ricardo Böheim, Technical University of Munich, Germany

Discussant: K. Ann Renninger, Swarthmore College, United States

This symposium brings together research that investigates the intersection between motivation/engagement and observable behavior in classrooms. In the literature, there is no clear consensus on the relationship between motivational/engagement constructs and observable behavior. Whereas motivational researchers often treat certain behaviors (e.g. task-choice, task completion etc.) as an outcome of student motivation, the literature on engagement treats behaviors as an aspect of behavioral engagement (e.g. verbal engagement). In both research areas, however there is a strong call for an increased implementation of behavioral measures as current research predominantly relies on self-reports. At the same time, there are many classroom behaviors (such as hand-raising) that researchers and teachers can observe whose motivational significance is unclear. This symposium assembles a coherent set of studies which all include measures of student behavior (observational) and motivation/engagement (self-report) in order to analyze how they theoretically frame and empirically investigate these concepts and their relationships. Findings provide empirical answers to questions as to what extent every day observable classroom behaviors such as hand-raising, individual work on tasks and collaborative group behavior reflect student motivation or non-motivation. Across studies, the discussion will take stock of current theorizing, methodology and findings on this intersection and provide future research directions. We will also discuss how results of this research can help teachers to arrive at more accurate interpretations of student behaviors as an expression of their motivation which may enable them to better support student learning and development.

What Motivates Students' Hand-Raising? On the relation between motivation and student behavior

Presenting Author: Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:** Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany

Student hand-raising is an everyday behavior in classroom interactions with teachers. This behavior is ubiquitous and easily observable. In comparison, observable indicators of student motivation are limited. The present study examines if the behavior of student hand-raising indicates students' motivation. We present two studies that examine the variance in hand-raising and its relation to student motivation in two school subjects, Mathematics and Language Arts. Study 1 investigated $N = 397$ high school students in 20 classrooms during a videotaped lesson in each subject. Multilevel regression analysis suggests that student motivation accounts for significant variance in hand-raising. The results show subject-specific differences: Student self-concept predicts hand-raising in Mathematics, while students' situational interest predicts their hand-raising in Language Arts. Students' externally regulated motivation is predictive across both subjects. In Study 2, $N = 14$ high school students were interviewed about their hand-raising behavior. Results replicate findings from Study 1 and illustrate how students' motivation affects their hand-raising behavior. In summary, our research contributes new insights to the discussion on directly observable behaviors and their relevance for motivational research.

Collaborative group behavior as indices of students' group and individual motivation and engagement

Presenting Author: Toni Rogat, Purdue University, United States; **Co-Author:** Britte Cheng, SRI International, United States; **Co-Author:** Anne Traynor, Purdue University, United States; **Co-Author:** Temitope Adeoye, Purdue University, United States; **Co-Author:** Andrea Gomoll, Indiana University, United States; **Co-Author:** Patrik Lundh, SRI International, United States; **Co-Author:** Cindy Hmelo-Silver, Indiana University, United States

In this study, we investigate how observations of collaborative group behavior correspond with group members' self-reported motivation and engagement for joint activity. This contributes to current efforts at developing inferences about how specific student behaviors can provide evidence of high-quality motivations. We draw from current situative conceptualizations of engagement as *productive disciplinary engagement (PDE)*, defined as making collective intellectual progress among core conceptual ideas and disciplinary activities during authentic tasks (Engle & Conant, 2002). Our presentation contributes to the symposium's goals by (1) extending examinations of relations between individual behaviors and self-reported motivation and engagement to understanding collaborative groups; (2) including participation (e.g., behavioral engagement), alongside more interactive and observable indicators of social, emotional, motivational, cognitive, and disciplinary engagement; (3) evaluating PDE using quality ratings anchored by critical behaviors rather than frequency counts; and (4) assessing students' self-reported group and individual motivation and engagement using both task-specific and post-unit retrospective measures, interrogating whether observed group engagement behaviors align best with proximal or distal retrospective self-report measures. This research utilizes data from two projects involving collaborative groupwork during authentic disciplinary tasks from curriculum aligned with recent reform efforts in science and mathematics. Participants were middle schoolers organized into heterogeneous groups ($N = 25$ groups). This analytic comparison elucidates how multiple measures and methodological strategies inform our interpretation of classroom behavioral indices. This research has design and practical implications regarding whether reform-based science and mathematics collaborative tasks are promoting the high-quality motivation, and subsequent group engagement, envisioned by national reform documents.

Silver linings: Can students be disengaged on the outside but engaged on the inside?

Presenting Author: Jennifer Symonds, University College Dublin, Ireland; **Co-Author:** James Schreiber, Duquesne University, United States; **Co-Author:** Benjamin Torsney, University College Dublin, Ireland

Is it true that students need to be psychologically engaged in learning to be on task in lessons? Does the same consistency occur for psychological and behavioral disengagement? And to what extent do these components of student engagement and their combinations impact task attainment? Using a mixture of person-oriented and variable centered approaches we established that profiles of momentary behavioral engagement were strong predictors of attainment on a single literacy task, followed by students' tendency to be motivated and supported by teachers (components of 'trait engagement'). However, students' momentary psychological engagement did not predict attainment. To investigate further we applied a second latent class analysis, uncovering that nearly 20% of the sample were psychologically engaged despite being behaviorally disengaged, fitting our metaphor of a silver lining inside a dark cloud. Implications of social distraction in learning contexts as a serious risk factor for the attainment of psychologically engaged students are discussed.

The relation between self-regulation and self-reported versus observed participation during class

Presenting Author: V. Charlotte Corrodi, Pädagogische Hochschule St. Gallen, Switzerland; **Co-Author:** Franziska Vogt, University of Teacher Education St. Gallen, Switzerland; **Co-Author:** Doris Kunz Heim, PH FHNW, Switzerland

Most educational scientists would agree that student participation is an important predictor of academic performance (Finn, et al., 1995). Nevertheless, a systematic empirical investigation of factors influencing student participation in primary school is missing (Godwin, et al., 2016). The aims of the study are to investigate, first, how a self-report measure and an observational measure of student participation in class are associated with each other and, second, how intrinsic motivation and self-control are related with student participation during class. Our sample is expected to include 30 classes of fifth grade primary schools in Switzerland. Data is collected in different subjects instructed by different teachers. Two measures are implemented: First, a standardized student observation in class. Second, a short student questionnaire after class. The data collection is ongoing. Preliminary results reported in this submission include 202 complete observations and questionnaires from 92 children in 5 primary school classrooms. The preliminary results from the correlation analysis show small Kendall's correlations between the two measures of participation during class. In the SEM analysis, data moderately fit with our theory-based models, suggesting that both, self-reported intrinsic motivation and self-reported self-control, independently contribute to participation during class and that both measures of participation are related with each other.

Session L 8

14 August 2019 15:30 - 17:00

Seminar Room - S05

Symposium

Instructional Design

The testing effect: Cognitive mechanisms and practical application

Keywords: Comprehension of text and graphics, Computer-assisted learning, Experimental studies, Instructional design, Language (Foreign and second), Learning approaches, Learning Technologies, Reading comprehension, Second language acquisition

Interest group: SIG 06 - Instructional Design

Chairperson: Tim Surma, Open University of the Netherlands, Netherlands

Organiser: Gesa van den Broek, Utrecht University, Netherlands

Discussant: Peter Verkoeijen, Erasmus University Rotterdam, Netherlands

Practicing the retrieval of knowledge from memory, for example, with flashcards or practice-tests, enhances long-term retention compared to other learning strategies. Surprisingly, given the plethora of studies demonstrating this so-called *testing effect*, there is still limited insight into the underlying cognitive mechanisms, and there are many open questions regarding boundary conditions of testing effects in educational practice. This symposium brings together four contributions that investigate how the testing effect is affected by the cognitive demands imposed by different study materials, testing formats, and individual differences in students' cognitive abilities. The first and second contribution focus on the cognitive demands that testing places on learners. The first contribution presents data on the relation between Swedish high school students' cognitive capacities and testing effects measured over a period of four weeks. The second contribution discusses the mental effort induced by different testing formats, such as open and closed questions, in relation to learning outcomes. The third and fourth contribution focus on testing of complex materials. The third contribution presents data from two experiments on retrieval practice of expository text, to show interactions between testing format, material interrelatedness, and the size of testing effects. The fourth contribution investigates testing effects in contextualized learning, presenting a classroom study on the effect of retrieval opportunities during story reading. Our discussant, expert on the testing effect, will engage the authors and audience to discuss crucial cognitive mechanisms and the possibilities and pitfalls of integrating retrieval in educational practice.

The testing effect and individual differences in cognitive proficiency

Presenting Author: Bert Jonsson, Umeå University, Sweden; **Co-Author:** Carola Wiklund-Hörnqvist, Umeå University, Sweden, Sweden; **Co-Author:** Tova Stenlund, Umeå University, Sweden, Sweden

The present study investigated the relation between students' cognitive proficiency (CP) and the effects of retrieval practice, denoted as the testing effect. There are strong associations between students' cognitive proficiency and school achievement, and a critical issue is how cognitive proficiency influences the effect of learning methods that are cognitively demanding, like retrieval practice. The present within-subject classroom experiment investigated foreign vocabulary learning in Swedish upper secondary school students and tested to what extent students' cognitive proficiency influenced learning from retrieval practice. Cognitive proficiency was measured through a battery of cognitive tests targeting fluid intelligence, updating, processing speed, working memory, and episodic memory. From these measures, a broad CP-score was derived for each participant. It was found that students with high CP outperformed students with low CP, both during retrieval practice and on later tests of learning outcomes. However, independent of CP, retrieval practice led to higher learning outcomes than re-reading, at three retention intervals; immediately, one week and four weeks after practice. Thus, students of different cognitive proficiency levels benefited in similar way from retrieval practice.

The effect of test format on perceived mental effort

Presenting Author: Leonora Coppens, Utrecht University, Netherlands; **Co-Author:** Mario de Jonge, University Utrecht, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Liesbeth Kester, Utrecht University, Netherlands

Taking a test on studied materials typically results in better delayed recall than restudying (a.k.a. the testing effect). A common finding in research on the testing effect is that the memory benefits associated with testing are dependent on test format. In particular, free recall testing has often been found to be more effective than cued recall testing. This finding can be explained using the effortful retrieval hypothesis: A successful retrieval attempt requiring more mental effort will result in enhanced memory for a retrieved item. It is assumed that successful retrieval on a free recall test requires more effort on the learner's behalf, compared to successful retrieval on a cued recall test. In the present study, we tested this assumption. We compared perceived mental effort on different test formats (free recall vs. cued recall vs. recognition) to a baseline control condition (restudying). Results showed no differences between conditions in perceived mental effort during the learning phase and retention after one week. These findings are not in line with the effortful retrieval hypothesis.

Moderators of the Testing Effect: Type of Retrieval Practices Interacts with Interrelated Texts

Presenting Author: Tino Endres, University of Freiburg, Germany; **Co-Author:** Alexander Renkl, University of Freiburg, Germany

Retrieval practice is a learning strategy that involves recalling information from memory. Retrieval practice enhances retention, an effect known as *testing effect*. Although the testing effect is rather robust with factual material, there is discussion about possible boundary conditions of the testing effect especially with complex materials. One boundary condition that may substantially influence testing effects is whether learning contents are interrelated or not. In two experiments, we investigated the influence of interrelatedness on the testing effect and the interaction of interrelatedness with retrieval task, comparing specific (e.g., short-answer tasks) and unspecific retrieval tasks (e.g., free-recall tasks). Both studies were within-subject designs. Participants in both experiments studied two expository texts, which each consisted of four content sections: two sections consisted of information units that were interrelated within each section and two sections consisted of non-interrelated idea units. In the first experiment (N=37), after reading the texts, participants either read the text again or retrieved information from interrelated and not-interrelated text sections. In the second experiment (N=53), after reading the texts, participants retrieved contents either with short-answer tasks or with a free-recall task. The retrieval of interrelated contents increased retention compared to non-interrelated contents. Furthermore, there was an interaction of interrelatedness and type of retrieval task. Short-answer tasks led to better recall performance of interrelated sections than free-recall tasks. These findings confirm the assumption that the testing effect depends on the interrelatedness of learning contents and the format of the retrieval tasks.

Testing the Testing Effect in Contextualized Learning: Effects of Retrieval during Story Reading

Presenting Author: Gesa van den Broek, Utrecht University, Netherlands; **Co-Author:** Eva Wesseling, Utrecht University, Netherlands; **Co-Author:** Linske Huijssen, Utrecht University, Netherlands; **Co-Author:** Liesbeth Kester, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

Testing effect studies have shown that practicing the retrieval of word-translation pairs, for example with flash cards, is an effective vocabulary learning strategy. In real life, many words are, however, encountered in context. The present study investigated if there are testing effects in such contextualized learning. We manipulated retrieval indirectly, by changing the context in which words appeared: comparing uninformative context that required retrieval to be understood (*retrieval condition*, e.g., "She bought a *knyga*.") and informative context from which word meaning could be inferred (*inference condition*, e.g., "She borrowed an interesting *knyga* from the library." [book]). In a recent study, exercises with comparable sentences led to better retention in the retrieval condition. The present study tested if retrieval benefits also occur when words are embedded not in an exercise but in a story which is read for comprehension. In a within-subject experiment, 101 adolescents ($M_{age}=14.8$) encoded 16 foreign vocabulary words, and then read a story which contained half of the target words in a retrieval condition, and half in an inference condition. Word recall measured one to two days after story reading showed an unexpected negative effect of the retrieval condition where later recall was significantly higher in the inference condition. A possible explanation why the retrieval condition did not enhance retention is limited retrieval success and lack of feedback during reading. Moreover, the informative context in the inference condition may have induced beneficial elaboration. These findings demonstrate that boundary conditions exist of testing effects in incidental learning from context.

Session L 9

14 August 2019 15:30 - 17:00

Lecture Hall - H05

Symposium

Higher Education, Learning and Instructional Technology

Measuring and Supporting Self-Regulated Learning in Different Contexts in Higher Education

Keywords: Cognitive skills, E-learning/ Online learning, Educational technology, Emotion and affect, Higher education, Metacognition, Mixed-method research, Multimedia learning, Quantitative methods, Self-regulation, Student learning

Interest group: SIG 16 - Metacognition

Chairperson: Jacqueline Wong, Erasmus University Rotterdam, Netherlands

Chairperson: Felicitas Biber, Maastricht University, Netherlands

Organiser: Hans Smolderen, Antwerp University, Belgium

Organiser: Michelle Taub, University of Central Florida, United States

Discussant: Inge Molenaar, Radboud University Nijmegen, Netherlands

Research on understanding the effectiveness of SRL supports in different contexts is crucial to help foster learners' competencies in higher education (e.g., life-long learning). Yet, understanding how SRL is applied in context and how SRL can be measured and supported are challenges in SRL research. The four studies in this symposium present findings from examining SRL in diverse contexts (e.g., flipped course, self-study, online, multimedia-systems) using different types of data. We aim to provide insights and to integrate multiple approaches to measure and support SRL in online and offline learning environments. This will provide a novel ground and transition from theory to practice in educational sciences. Smolderen and colleagues triangulated log files, learning diaries, and screen and video recordings to examine the impact of SRL on in-class activities in a flipped course. Biber and colleagues used a mixed-method approach to examine the effectiveness of a six-week learning strategy training on metacognitive knowledge and use of cognitive learning strategies in a self-study environment. Wong and colleagues examined the effectiveness of prompting only as well as prompting and recommending SRL strategies on learners' proportion of course completion and course grades in a Massive Open Online Course. Taub and colleagues examined SRL in a multimedia-based tutoring system. Eye-tracking data, facial expressions, and metacognitive content evaluation judgments were measured. These four studies give insights into the complex nature of SRL in different contexts and discuss the issues and challenges in measuring and supporting SRL processes. Inge Molenaar will act as the discussant.

Investigating the Role of Students' Preparation on the In-Class Learning Behavior: A SRL Perspective

Presenting Author: Hans Smolderen, Antwerp University, Belgium; **Co-Author:** David Gijbels, University of Antwerp, Belgium; **Co-Author:** Sven De Maeyer, University of Antwerp, Belgium

In a flipped learning environment, students have to self-regulate both during the pre-class preparation and during the in-class learning activities. In this study, the focus lies on grasping the way in which students self-regulate their learning activities during class and how this is related to their learning behavior while preparing pre-class. The data were collected in a statistics course using log files, self-reported learning diaries, screen recordings, video recordings of in-class activities and audio recordings of teacher-student interaction. After performing data triangulation to control for the reliability of the learning diaries, sequence analysis and fuzzy clustering techniques are used. A first preliminary cluster analysis showed distinctions between student groups based on their learning activities. The further findings of this study will give a better understanding of the way in which students self-regulate in the different stages of a flipped learning environment. The novelty of this study lies in the expansion of the study of self-regulation in the flipped classroom from the preparation phase to the whole learning process.

Fostering Students' Learning Strategies in Higher education – An Explanatory Mixed-Method Study

Presenting Author: Felicitas Biber, Maastricht University, Netherlands; **Co-Author:** Anique de Bruin, Maastricht University, Netherlands; **Co-Author:** Pauline Aalten, Maastricht University, Netherlands; **Co-Author:** Mirjam oude Egbrink, Maastricht University, Netherlands

Entering higher education, students face the challenge of self-regulating their learning. Due to a lack of formal training, students develop their own learning strategies that are often ineffective, such as rereading and highlighting, instead of applying effective cognitive learning strategies, such as practice testing or distributed practice. Using an explanatory mixed-method study, we examined the effect of a six-week learning strategy training on students' metacognitive knowledge and use of cognitive learning strategies. During the training, students were informed of the effectiveness and empirical evidence of ten of the most commonly used learning strategies. Forty-seven first-year students were randomly assigned to either an intervention condition in which students received three training sessions over six weeks or a waiting list control condition in which students received the same training at the end of the study. Pre-post analyses revealed the training had a positive effect on students' metacognitive knowledge accuracy and use of the effective strategy quizzing. A thematic analysis of focus group data revealed barriers and mediators that can explain the discrepancy between knowledge and usage of effective learning strategies.

Supporting Self-Regulated Learning in a Massive Open Online Course: Do Learners Benefit?

Presenting Author: Jacqueline Wong, Erasmus University Rotterdam, Netherlands; **Co-Author:** Martine Baars, Erasmus University Rotterdam, Netherlands; **Co-Author:** Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:** Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Self-regulated learning (SRL) is relevant for studying in the context of Massive Open Online Courses (MOOCs) because MOOCs typically offer very low levels of instructional support and learners are expected to take charge of their learning. Results from MOOC-related research suggest that learners are more likely to be successful when they used SRL strategies. However, many learners are weak in SRL. In this study, we examined the effect of two-types of SRL-support on course completion and grades by randomly assigning MOOC learners to three conditions: i) SRL-prompt only, ii) SRL-prompt-and-recommendation, and iii) control without any SRL-supports. Results showed that learners who received SRL prompts and recommendations completed a higher proportion of course items than those without any SRL-support. However, learners who received SRL-prompts only did not complete a significantly higher proportion of course items than those without any SRL-support or than those who received SRL prompts and recommendations. This suggests that learners who accessed the SRL-support videos with prompts and recommendations appear to be more engaged in the course. This however did not coincide with higher performance as there were no significant differences in course grades among conditions. The current study contributes to the study of SRL by empirically examining the effect of SRL-supports in MOOCs. It also adds to the understanding of MOOC learning behavior by exploring the analysis of log data. Future research should examine learner activities indicative of SRL and the influence of SRL-supports on these learner activities.

Using Multimodal Data to Detect Self-Regulatory Processes During Learning with a Multimedia-System

Presenting Author: Michelle Taub, University of Central Florida, United States; **Co-Author:** Robert Sawyer, North Carolina State University, United States; **Co-Author:** Megan J. Price, University of Central Florida, United States; **Co-Author:** James Lester, North Carolina State University, United States; **Co-Author:** Roger Azevedo, University of Central Florida, United States

The goal of this study was to use multimodal data to examine the complex interplay between college students' ($n = 89$) cognitive, affective, and metacognitive self-regulated learning processes during learning with a multimedia-based tutoring system. We used a within-subjects design, where participants progressed through 16 trials to learn biology content. During each trial, they read text content and inspected diagrams, made metacognitive judgments, and answered questions about the function and malfunction of eight body systems. We collected and analyzed eye-tracking data, videos of facial expressions of Action Units, and metacognitive content evaluation judgments, and their association with performance for each trial. Results using multilevel modeling indicated that a model including all multimodal variables revealed Action Unit 4 (brow lowerer) negatively predicted performance while accuracy of making a content evaluation judgment on the diagram positively predicted performance. These results emphasize the complex nature of self-regulated learning, and specifically the different

impacts of cognitive, affective, and metacognitive processes on performance. In addition, findings from this study can impact the development of intelligent learning environments that provide scaffolding and feedback based on real-time self-regulated learning behaviors.

Session L 10

14 August 2019 15:30 - 17:00

Seminar Room - S09

Single Paper

Assessment and Evaluation, Learning and Social Interaction

Educational Effectiveness

Keywords: Cognitive skills, Competencies, Language (L1/Standard Language), Literacy, Primary education, Quasi-experimental research, School effectiveness, Social development

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Jan Van Damme, KU LEUVEN, Belgium

Student, teacher and classroom level correlates of sixth' grade students' listening skills

Keywords: Cognitive skills, Language (L1/Standard Language), Literacy, Primary education

Presenting Author: Heleen Bourdeaudhui, Ghent University, Belgium; **Co-Author:** Koen Aesaert, Ghent University, Belgium; **Co-Author:** Johan van Braak, Ghent University, Belgium

Listening skills play an important role in children's educational life, but potential correlates of primary school students' listening skills have been barely identified. This study investigates the relationship between student, teacher and classroom level characteristics and primary school students' listening skills. In total, 70 teachers, 974 sixth-grade students and their parents completed a teacher, student and parent questionnaire. Students also accomplished a listening test and a working memory test. The data were analyzed by means of a regression analysis with a two-level design. Results indicate that different student characteristics, such as home language, having a learning disorder, grade retention, socio-economic status, educational support at home and working memory are significantly related to listening skills. In addition, results show that teacher experience and classroom composition are positively correlated with students' listening skills. As to the effect of teacher attitudes and teacher practices, no significant relationship with students' listening skills was found.

The effect of Success for All on pro- and antisocial behavior of young students in elementary school

Keywords: Primary education, Quasi-experimental research, School effectiveness, Social development

Presenting Author: Marij Veldman, University of Groningen, Netherlands; **Co-Author:** Simone Doolaard, University of Groningen, Netherlands; **Co-Author:** Mariëtte Hingstman, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands; **Co-Author:** Tom Sniijders, University of Groningen, Netherlands; **Co-Author:** Roel J. Bosker, Rijksuniversiteit Groningen, Dept of Education and GION, Netherlands

Success for All (SfA) is a comprehensive school program that aims to improve students' cognitive as well as social emotional learning. SfA has been shown to be effective in increasing student achievement in the US and the UK, and is currently being adapted for Dutch educational practice. Although there is considerable empirical evidence for SfA being effective in cognitive student outcomes in the US and the UK, evidence for social student outcomes is mostly anecdotic; teachers described what they have seen happening to students' behavior in their classroom by introducing SfA. The most important components in the current Dutch SfA program to increase students' social emotional skills are: a powerful curriculum, proactive classroom management strategies, a cooperative learning approach, and using a reward system for fostering positive behavior to create a positive environment where children are encouraged to be successful. The present study aims to find out whether there is empirical evidence for the impact of the SfA program on prosocial and antisocial behavior of young students in elementary school. The study uses a quasi-experimental design with treatment and a control group. The total sample consisted of 363 grade 1 students and 340 grade 2 students in 17 SfA classes and 19 control classes. A sociometric method was used to assess students' pro- and antisocial behavior. Differences between treatment and control group in pro- and antisocial behavior of students are analyzed on two measurement points using multivariate multilevel analysis. Findings will be presented at the conference.

Primary students' participation in extracurricular activities in German all-day schools

Keywords: Competencies, Primary education, Quasi-experimental research, School effectiveness

Presenting Author: Wolfram Rollett, University of Education Freiburg, Germany; **Presenting Author:** Karin Lossen, IFS / Technical University of Dortmund, Germany; **Co-Author:** Katja Tillmann, TU Dortmund University, Germany; **Co-Author:** Heinz Günter Holtappels, TU Dortmund University, Germany

Due to the unexpected weak results of German students in PISA 2000 schools with an extended schooling time and an extracurricular program have been implemented. These so called "all-day schools" tend to leave it to the students' choice which extracurricular activity they attend, which can result in problematic segregation effects. The research question of this paper is whether students' individual characteristics correspond with the probability of participating in extracurricular reading and natural science activities. In the longitudinal study StEG-P 67 all-day primary schools and 2'149 students were surveyed in 3rd and 4th grade. Educational and migration background as well as SES of the family of origin had no impact on the participation rates. At the same time, girls and students with a higher reading performance were more likely to take part in reading activities. The participation in natural science activities did not show such results. The findings suggest that schools should be aware of the results voluntarily enlisting in different kinds of extracurricular activities may have. Activities could be designed more specifically to meet the interests and needs of educationally disadvantaged groups of students. Gender stereotyped picking of activities could be counteracted by accordingly supporting students in their choosing process.

Session L 11

14 August 2019 15:30 - 17:00

Seminar Room - S13

Single Paper

Higher Education

Conceptual Change

Keywords: Cognitive development, Conceptual change, Educational Psychology, Experimental studies, Higher education, Misconceptions, Primary education, Reasoning, Science education, Secondary education, Social sciences

Interest group: SIG 03 - Conceptual Change

Chairperson: Denisse Gelber, Pontificia Universidad Católica de Chile, Chile

How to promote epistemic change? Effects of reading and reflecting on resolvable controversies.

Keywords: Conceptual change, Experimental studies, Higher education, Social sciences

Presenting Author: Martin Kerwer, Leibniz-Institute for Psychology Information (ZPID), Germany; **Co-Author:** Tom Rosman, Leibniz Institute for Psychology Information, Germany

Research has identified two driving forces of epistemic development: Dealing with conflicting knowledge claims as well as reflecting on knowledge and knowing. Thus, in order to foster advanced beliefs about knowledge and knowing, a 'resolvable controversies' intervention was developed over the years by our work group. Participants are first presented descriptions of studies yielding apparently conflicting results, and subsequently are incited to reflect on this information in a writing task. In the present paper, we outline the intervention's development by reanalyzing data of three randomized studies that examined the intervention's overall efficacy and its efficacy depending on the kind of writing instruction participants received. In Study 1 ($N=86$), we found that effects of reflection did not

strongly differ for subjects that were instructed to either identify moderating variables, provide a general overview of findings, or write a one-sided-argument. Study 2 ($N=145$) replicates findings of Study 1 and establishes the intervention's overall efficacy (i.e., without a control group) using the 'original' reflection writing instruction (instruction to identify moderating variables). In Study 3 ($N=139$), we compared effects of the intervention to a control group in which the writing instruction was omitted and a control group in which students did not receive any controversial information or writing instruction at all. Overall, our results indicate that the resolvable controversies intervention has beneficial effects on epistemic beliefs and that both presenting diverging information and reflecting upon these controversies independently contribute to these effects.

Is natural number bias the unique reason of misunderstanding rational number size?

Keywords: Conceptual change, Misconceptions, Primary education, Secondary education

Presenting Author: Juan Manuel González-Forte, Universidad de Alicante, Spain; **Co-Author:** Ceneida Fernández, Universidad de Alicante, Spain; **Co-Author:** Jo Van Hoof, KU Leuven, Belgium; **Co-Author:** Wim Van Dooren, KU Leuven, Belgium

Understanding rational number is a complex task for primary and secondary school students, and even for adults. Previous research has shown that a possible reason is students' tendency to apply (inappropriately) the properties of natural numbers when they are working with rational numbers (phenomenon called natural number bias). Focusing on comparison tasks, recent research has shown that other incorrect strategies such as *gap thinking* or *reverse bias* can also explain these difficulties. The current study aims to investigate different ways of students' thinking in comparison tasks. Participants were 1262 primary and secondary school students. These students had to answer 35 items of comparing fractions and decimal numbers. Variables taken into account in these items were congruence/incongruence with the ordering of natural numbers, gap between numerator and denominator, and presence/absence of common components. A Two-step cluster analysis revealed six different profiles of students thinking. Results show that while students' reasoning based on the properties of natural numbers (*natural number bias*) decreases along primary and secondary school, almost disappearing at the end of the secondary school, students' reasoning based on *gap thinking* increases along these grades. This result seems to indicate that when the reliance on natural numbers is overcome, it is followed by qualitatively different errors before the stage of correct understanding is reached.

Conceptual change challenges in medicine - from biomedical knowledge to clinical reasoning

Keywords: Conceptual change, Higher education, Misconceptions, Reasoning

Presenting Author: Ilona Södervik, University of Helsinki, Finland; **Co-Author:** Mirjamajja Mikkilä-Erdmann, University of Turku, Finland; **Co-Author:** Michelene Chi, Arizona State University, United States

This study investigates the relevance of conceptual change perspective in the development of expertise during medical studies. Medical students' conceptual understanding and clinical reasoning concerning the content of central cardiovascular system were investigated during the first years of studies. Professional development was inspected from the perspectives of biomedical knowledge, clinical knowledge and skills to solve a patient case. Biomedical misconceptions in the levels of false beliefs and mental models were identified. Students with misconceptions were more likely to give lower level answers in clinical application task and to make inaccurate diagnoses compared to those students who had accurate conceptual understanding. Thus, conceptual change perspective is relevant in the development of medical expertise. Based on the results, pedagogical suggestions are discussed.

Looking at Conceptual Development and Conceptual Change from a Complex Systems Framework

Keywords: Cognitive development, Conceptual change, Educational Psychology, Science education

Presenting Author: Stella Vosniadou, Flinders University, Australia

Jacobson, Kapur and Reimann (2016) propose a *Complex Systems Conceptual Framework of Learning (CSCFL)* that they argue can provide a theoretical rapprochement of cognitive, situative and other theories of learning by accounting for certain omissions in these theories, such as sensitivity to initial conditions and emergence, and bring to the study of learning methodologies that have the potential to yield new and innovative insights. In this presentation, I will consider what this proposal has to offer to the study of conceptual development and conceptual change. Briefly, I will argue that by conceptualizing individuals' conceptual ecologies as a complex system that involves dynamic interactions among multiple agents, we can account for the formation of framework theories or misconceptions as emerging from smaller conceptual or sub-conceptual elements. Moreover, a complex systems approach can consider discourse dynamics as theoretically continuous with conceptual dynamics, thus bridging situative with cognitive perspectives on conceptual development and conceptual change.

Session L 12

14 August 2019 15:30 - 17:00

Seminar Room - S11

Single Paper

Assessment and Evaluation, Educational Policy and Systems, Teaching and Teacher Education

Educational Theory and Student Learning

Keywords: Assessment methods and tools, Competencies, Educational policy, Mixed-method research, Primary education, Psychometrics, Quantitative methods, School effectiveness, Secondary education, Student learning, Teaching/instruction

Interest group: SIG 17 - Methods in Learning Research, SIG 25 - Educational Theory

Chairperson: Jennifer Schwarze, RWTH Aachen University, Germany

Implications of Competence-Based Education Approaches to Curriculum Policy-making

Keywords: Competencies, Educational policy, School effectiveness, Teaching/instruction

Presenting Author: Armend Tahirsylaj, Norwegian University of Science and Technology, Norway; **Co-Author:** Daniel Sundberg, Linnaeus University, Sweden

This paper relies on a systematic review of literature concerning competence-based education (CBE) approaches, specifically focusing on four identified topical categories, namely curriculum policy, teacher understanding of CBE, curriculum implementation, and assessment of key competences. It provides a synthesis of the state of the art with regard to educational research that focused on competence-based education and curricula covering a period of 20 years – starting with 1997 as the first year after UNESCO's Jacques Delors report in 1996 (Delors, 1996). It is a relevant contribution as very little is known from the educational research perspective how curriculum policy, teacher understanding of CBE, curriculum implementation, and assessment of key competences have been shaped under CBE approaches within and across national education systems. As it has been argued, educational policy and practice gain much from systematic reviews and research syntheses (Davies, 2000). Two key research questions are addressed here: (1) How much research is reported in the peer reviewed literature about 'competence-based education', 'competence-based curricula', 'key competences', and 'key competencies' education? And (2) What is geographical distribution, themes, education levels, subject matter domains, research methodologies, and key findings of the studies in CBE research? Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Liberati et al., 2009) is applied as review strategy. Findings are underwhelming, and show that CBE field is underdeveloped, underresearched and undertheorized. Most articles fall under 'Applied' Educational Research and Scholarship knowledge tradition as per Knowledge Traditions Framework (Furlong & Whitty, 2017).

Blossoming in schools. On the flourishing of pupils and teachers

Keywords: Primary education, Secondary education, Student learning, Teaching/instruction

Presenting Author: Doret de Ruyster, University of Humanistic Studies, Netherlands

This paper discusses the implications of perceiving human flourishing as an aim of education. Concisely put, people flourish when they actualise their human potential and use their actualised capacities to live a meaningful and worthwhile life. After an elaboration of this definition, I first briefly sketch the content of education for flourishing. However, I will focus on the didactics of teaching, which brings me to the flourishing of pupils, as education for flourishing also implies that education should be worthwhile and meaningful for pupils. Finally, pupils also learn by example and therefore, ideally, they have teachers who flourish. The second part of the paper explores the flourishing of teachers. I propose that teachers flourish as professionals, because teaching is a worthwhile activity in

which teachers have to express their human potential. Moreover, teaching for flourishing is also a meaningful way for teachers to express their potential. However, the flourishing of teachers is also challenged: in their work teachers have to navigate between their educational intention to enable pupils to flourish, professional standards, curriculum requirements, administrative duties and the values and wishes of pupils and parents. The paper ends with a discussion of ways in which teachers can deal with these challenges.

Linking Low-Stakes and High-Stakes Assessments over Person Ability Scores

Keywords: Assessment methods and tools, Psychometrics, Quantitative methods, Student learning

Presenting Author: Martin J. Tomasik, University of Zurich, Switzerland; **Co-Author:** Laura A. Helbling, University of Zurich, Switzerland; **Co-Author:** Stéphanie Berger, University of Zurich, Switzerland; **Co-Author:** Urs Moser, University of Zurich, Switzerland

Some applications of item response theory (e.g., cohort comparisons of school performance or measurement of learning progress) require that scores from multiple assessments are linked on a common scale. Usually, this is achieved by placing linking items across the different assessments and fixing the parameters of these items to be equal. This is not feasible when the testing situation is too different as in the case of low-stakes vs. high-stakes assessments. An alternative approach then is to link over ability parameters of subjects who have participated in different assessments. We introduce results of such linking in a sample of $N = 1,771$ (for language) resp. $N = 2,106$ (for mathematics) students who have participated in both a low-stakes and a high-stakes assessment. Results suggest an almost perfect correlation of the item parameters. However, we also find a constant shift in the average difficulty of the assessments that makes the very same items appear more difficult under the low-stakes condition as compared to the high-stakes condition. We argue that this shift can be explained with motivational factors. Using the suggested approach, we are able to link formative with summative assessments and hence directly and reliably predict the scores on the latter one by scores on the former one, which increases the validity and interpretability of results from formative assessments.

Building students' collaborative knowledge work competence in upper secondary classrooms

Keywords: Competencies, Mixed-method research, Secondary education, Student learning

Presenting Author: Minna Lakkala, University of Helsinki, Finland; **Co-Author:** Liisa Ilomäki, University of Helsinki, Finland; **Co-Author:** Hanni Muukkonen, University of Oulu, Finland; **Co-Author:** Auli Toom, University of Helsinki, Finland

Upper secondary education should provide students with relevant competence for further studies and lifelong development: students are expected to learn collaborative knowledge work practices in order to be able to succeed in knowledge-based and digitalized society. This requires that teachers utilize pedagogies that support the learning of such abilities. This study investigates upper secondary students' learning of knowledge work and online inquiry competence in the context of pedagogical intervention implemented in five teaching groups. Survey data from students and interview data from teachers were collected after the intervention. Students evaluated their learning of online inquiry (searching for information and evaluating knowledge sources) quite high. Students reported that the ways of working in the group project were novel to them, but they had mixed opinions of the challenge and usefulness of the task. The results show that there is variation in how important upper secondary students consider the practicing of collaborative knowledge work and online inquiry skills. Teachers perceived the pedagogical intervention materials – syllabus, teaching materials, guidelines, project report template and digital workspace – as applicable in the curriculum of Mother tongue and literature course. Still, they reported that it was challenging to strictly follow ready-made pedagogical design; in ordinary situation, they would have more freedom to adjust their teaching in relation to students' learning needs and progress. The findings suggest that pedagogical interventions and materials can pave the way for the use of optimal pedagogies in upper secondary classrooms to build students' knowledge work competence and further improve student learning.

Session L 13

14 August 2019 15:30 - 17:00

Seminar Room - S03

Single Paper

Educational Policy and Systems, Higher Education

Educational Policy

Keywords: At-risk students, Educational policy, Higher education, Metacognition, Qualitative methods, Quantitative methods, Reasoning

Interest group: SIG 04 - Higher Education, SIG 16 - Metacognition

Chairperson: Sanaz Farhangi, Florida International University, United States

Cheating Among International Students: A New Challenge to Universities in the Era of Globalization

Keywords: At-risk students, Educational policy, Higher education, Quantitative methods

Presenting Author: Perry Gao, Harvard University, United States; **Co-Author:** Arvid Nagel, University of Teacher Education St.Gallen, Switzerland

Concern about academic integrity among international students has increased at a time when their number in American universities has been rapidly growing. In response to widespread media reports about the rising cases of international students cheating scandals and the lack of empirical research, we have conducted an unprecedented study examining confidential institutional data and student records collected at a major public university on the west coast in the US. We discovered patterns behind the number and the scale of the problem. The study has successfully examined the propensity of academic misconduct among different student groups and identified the correlation between the occurrence of academic misconduct and other institutional records (e.g., admission test score, gender, major, etc.).

Scaling up instructional innovations by collaboration between researchers and instructional leaders

Keywords: Educational policy, Metacognition, Qualitative methods, Reasoning

Presenting Author: Anat Zohar, Hebrew University, Israel; **Co-Author:** Tova Michalsky, Bar-Ilan University, Israel; **Co-Author:** Yehudith Weinberger, Kibbutzim College of Education, Israel

Researchers view scaling up instructional innovations as one of the key challenges for educational reforms. More specifically, a large gap exists between practice and policy in the area of higher order thinking and metacognition. Our goal is to explore how a collaboration between researchers and senior instructional leaders, may contribute to improving the challenges created by the shallow implementation when programs in the area of higher order thinking and metacognition are scaled up. The study was conducted within a 36 hours workshop that spanned over 9 months. The 20 participants were a mixed group of researchers and senior instructional leaders in science and history. An important part of the workshop was the facilitation of a dialogue between researchers' "top down", literature-based knowledge, and "bottom up", practical knowledge emerging from practitioners' experiences and needs. Data analysis used a narrative approach. The findings document the value of shared learning of researchers and instructional leaders for scaling up an innovation in the area of fostering students' reasoning and metacognition. Conclusions indicated that before starting to construct meta-level processes, our innovation must consolidate teachers' knowledge of reasoning on the cognitive level. Another conclusion pointed to a need to limit the number of thinking strategies that our meta-level innovation could address and to design more structured and concrete examples of model meta-level learning activities. In addition, we discovered various pedagogical patterns and administrative routes generated by the workshop for future large-scale implementation. The implications for future research and practice are discussed.

Session L 14

14 August 2019 15:30 - 17:00

Seminar Room - S12

Single Paper

Learning and Instructional Technology

Learning Analytics

Keywords: Assessment methods and tools, Computer-assisted learning, Computer-supported collaborative learning, Content analysis, Educational technology, Game-based learning, Instructional design, Learning analytics, Learning Technologies, Mixed-method research, Reasoning, Self-regulation, Social aspects of learning and teaching

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition

Chairperson: Therese Grohnert, Maastricht University, Netherlands

Predictive Analytics for Serious Games

Keywords: Assessment methods and tools, Educational technology, Game-based learning, Learning analytics

Presenting Author: Michael Kickmeier-Rust, University of Teacher Education, Switzerland

The prediction of learning performance can be an important task for the personalization and the balancing of serious games. A growing community in the field of Learning Analytics investigates the methods and technologies to make predictions about the performance, learners may exhibit within a specific program or setting. Performance predictions can enrich the capabilities and effectiveness of serious games also. For personalized, adaptive serious games, predictions add a new dimension and data source for the personalization and the balancing of gaming (and learning) experiences. The Learning Performance Vector enables integrating information about a learning domain model (i.e., the competencies and the structure of competencies a game is intended to convey) and log file information from games to make performance predictions. These predictions can be used to better adapt a game to a learner's strength and weaknesses and to make such adaptations at an earlier stage than it was possible before.

A learner dashboard and digital formative assessment approach for teamwork in Secondary schools

Keywords: Computer-supported collaborative learning, Instructional design, Learning analytics, Mixed-method research

Presenting Author: Elizabeth Koh, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:** Jennifer Tan, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:** Yi-Huan Tee, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:** Dhivya Suresh, National Institute of Education/Nanyang Technological University, Singapore, Singapore

This paper describes a web-based learner dashboard that was developed as part of a digital formative assessment intervention for K-12 learners to encourage better teamwork. The dashboard visualization focuses on a micro-profile of students' disposition analytics. The dashboard promoted the regulation of students' teamwork behaviours through explicit scaffolding of students' reflection and goal-setting. A two-group pre-test and post-test quasi-experiment was performed with 157 students to examine students' teamwork conceptions. Interestingly, individualistic conceptions increased while cooperative conceptions maintained in the intervention condition. Qualitative data are drawn on to explain some of the results. These suggest that the intervention's learner-facing dashboards helped students to gain a better awareness of their teamwork behaviors and regulate their teamwork goals.

Hypervideo annotations: Learning analytics, content analysis, and lecturers and students' interviews

Keywords: Content analysis, Learning analytics, Learning Technologies, Social aspects of learning and teaching

Presenting Author: Ina Blau, Open University of Israel, Israel; **Co-Author:** Tamar Shamir-Inbal, Open University of Israel, Israel

This paper examines integration of a hyper-video platform containing personal and shared annotations in three large undergraduate courses (A, B & C, in total 880 students) at a large university. The study combines learning analytics of video recordings of synchronous lessons (9-15 sessions per course, two hours each), content analysis of the annotations written by students and lecturers, and semi-structured interviews with the lecturers and with actively-participating students. The log analysis was conducted at the user level and at the video level. Content analysis was based on the Community of Inquiry framework (Garrison et al., 1999, 2010). The findings revealed that without academic credit, slightly over 10% of undergraduates chose active participation, beyond watching videos and reading others' annotations. The majority of hyper-video annotations were shared posts and replies (73-96%) rather than personal notes. Relatively to the number of students, the rate of reading annotations was significantly higher in Course C. Accordingly, content analysis revealed significantly more "cognitive presence" and "social presence" in Course C, while the amount of "teaching presence" was similar in all courses. However, all courses used the same interaction pattern: "student's question - lecturer's answer", without promoting peer feedback. The implications for theory and pedagogical design of hyper-video in academia are discussed.

Efficiency Matters: Revealing Clinical Reasoning Patterns Using Sequential Mining Techniques

Keywords: Computer-assisted learning, Learning analytics, Reasoning, Self-regulation

Presenting Author: Shan Li, McGill University, Canada; **Co-Author:** Juan Zheng, McGill University, Canada; **Co-Author:** Amanda Jarrell, McGill University, Canada; **Co-Author:** Susanne Lajoie, McGill University, Canada

This study examined the influence of self-regulated learning on diagnostic efficiency in the context of diagnosing a virtual patient using BioWorld (Authors, 2009), a technology rich environment designed for medical students to practice clinical reasoning. Eight-two medical students who correctly solved a Diabetes Mellitus case were included in this study. These students were grouped using K-means clustering into efficient and less efficient groups based on the time they spent diagnosing the case. Students' clinical reasoning behaviors were recorded in log files and further coded as either relevant or irrelevant to the final correct diagnosis. Independent t-tests and sequential pattern mining were then conducted to compare the differences between efficient and less efficient groups. Results revealed that participants in the less efficient group had significantly more irrelevant evidence, relevant tests, irrelevant tests, and incorrect hypothesis than efficient students. Furthermore, less efficient participants revealed different event subsequences than efficient students. These findings reveal group differences in the role that monitoring played in clinical reasoning, whereby the efficient group monitored their behaviour more than the less efficient. The results have implications for scaffolding learners in technology rich learning environments.

Session L 15

14 August 2019 15:30 - 17:00

Seminar Room - S01

Single Paper

Developmental Aspects of Instruction, Instructional Design

Teaching and Instructional Design

Keywords: Achievement, Early childhood education, History, In-service teacher education, Instructional design, Primary education, Quasi-experimental research, Secondary education, Self-regulation, Student learning, Teaching approaches, Teaching/instruction

Interest group: SIG 06 - Instructional Design

Chairperson: Julian Decius, University of Paderborn, Germany

Teaching historical agency. Examining changes in students' perception of agency in past and present

Keywords: History, Quasi-experimental research, Secondary education, Teaching approaches

Presenting Author: Marjolein Wilke, KU Leuven, Belgium; **Co-Author:** Fien Depaepe, KU Leuven, Belgium; **Co-Author:** Karel Van Nieuwenhuyse, KU Leuven, Belgium

Agency – the ability to take action and make decisions in society to generate societal change – is not only considered to be an important notion in the development of historical thinking, it is also expected to be at the heart of democratic decision making. Historical thinking about agency is believed to have an important impact on civic behaviour in the present. Despite the importance of agency as a second-order concept, it has received far less attention than other aspects of historical thinking in history education research. There is little empirical evidence to support the assumption that teaching about agency will affect students' understanding of the notion or their view on agency in the present. Through a quasi-experimental study, we aimed to address this gap by examining

the effects of explicit teaching about agency on students' understanding and perception of agency in the past, epistemological beliefs and views on agency in the present. A total of 112 students in the 11th grade of general secondary education participated (87 in the intervention group, 25 in the control group). Students received an intervention consisting of a two-hour lesson series. They completed a questionnaire and performance task in pre- and posttest, assessing their understanding of the concept of agency, epistemological beliefs and views on agency in the present. The data showed that, compared to the control group data, the intervention somewhat increased students' understanding of agency, affected their epistemological beliefs and their views on the distribution of agency among various agents in society today.

Latent class analysis in preschool teachers that received and implemented new vocabulary instruction

Keywords: Early childhood education, In-service teacher education, Instructional design, Teaching/instruction

Presenting Author:Paulina Pizarro, Universidad Diego Portales, Chile

The present study analyzed the vocabulary instruction practices that were used by the preschool teachers who participated in the professional development program Un Buen Comienzo [A Good Start]. This program was implemented in public school of Chile and in previous studies, it's showed findings that revealed change in teacher vocabulary instruction practices in response to the intervention. Then, the principal objective was to identify variability in the teachers who received and implemented vocabulary instruction practice UBC. A secondary analysis of data from the experimental study that investigated the fidelity of implementation of the UBC program (Mendive, Weiland, Yoshikawa, & Snow, 2016) was conducted. An analysis of latent classes was conducted to pre-kindergarten teachers from the experimental group, who presented at least one vocabulary event in the fidelity study. As a result, two latent classes were established. A group of nursery teachers who presented a high probability of implementing vocabulary instruction practices, and other group with a low probability of implementing such practices. The results are discussed in light of national and international literature.

Promoting Self-Regulated Learning in Primary School: Impact of an Educational Program

Keywords: Primary education, Quasi-experimental research, Self-regulation, Teaching/instruction

Presenting Author:Estrella Fernandez Alba, University of Oviedo, Spain; **Co-Author:**Elián Tuero Herrero, University of Oviedo, Spain; **Co-Author:**Rebeca Cerezo, University of Oviedo, Spain; **Co-Author:**Cristina Gómez Santos, University of Oviedo, Spain

Following a quasi-experimental design of a non-equivalent control group with pre-test and post-test, the present study evaluates the efficacy of an intervention program which intended to enhance the knowledge and the use of self-regulated learning strategies among 917 schoolchildren aged 8-11 of 14 primary schools from the North of Spain (control group = 510 students; intervention group = 407 students). The program, based in the social-cognitive model of self-regulated learning is a tool to work with the kids on a group of processes and learning strategies transversally among the curricular objectives: planning the tasks, establishing goals, organizing resources, monitoring the tasks, combating the distractors, evaluating the results and, also, emotional and behavioural aspects present in learning. The program was implemented by researchers trained for this purpose, along twelve sessions in total. The evolution of the kids from the intervention and the control groups was measured through an *ad hoc* questionnaire which was applied in both pretest and posttest sessions. The ANCOVA results showed that students who used the program significantly improved the knowledge and use of self-regulated learning strategies, what does not happen with the control group, so the program is a useful tool to train this kind of strategies in primary school stage.

Generative Learning vs. Retrieval Practice: The Cohesion and Elaboration of the Material Matters

Keywords: Achievement, Instructional design, Student learning, Teaching/instruction

Presenting Author:Julian Roelle, Ruhr-University Bochum, Germany; **Co-Author:**Matthias Nückles, University of Freiburg, Germany

Both generative learning tasks and retrieval practice tasks can serve as beneficial follow-up to an initial study phase in which learners have studied new learning material. However, research that systematically compares the effects of these two types of learning tasks is scarce. Therefore, it is widely unknown whether, and if so under which conditions, the one or the other type of task is better suited to optimize learning outcomes. In the present study, we predicted that the effects of generative learning and retrieval practice tasks would depend on the cohesion and elaboration of the learning material. To test this prediction, in two experiments learners received either (a) a generative learning task that asked them to organize and elaborate on the learning content, or (b) a retrieval practice task that engaged them in free recall after an initial study phase in which learners read an expository text that was either of high cohesion and elaboration (Experiment 1) or of low cohesion and elaboration (Experiment 2). We also implemented (c) a restudy condition and (d) a condition in which learners were engaged in both generative learning activities and retrieval practice. When the expository text was highly cohesive and elaborated, the retrieval practice task was more beneficial than the generative task. By contrast, when the learning material was of low cohesion and elaboration, the generative learning task was more beneficial. We concluded that the cohesion and elaboration of the learning material moderates the effects of generative learning and retrieval practice tasks.

Session L 16

14 August 2019 15:30 - 17:00

Seminar Room - S10

Single Paper

Instructional Design

Comprehension of Text and Graphics

Keywords: Comprehension of text and graphics, Educational Psychology, Experimental studies, Multimedia learning, Quantitative methods, Reading comprehension

Interest group: SIG 02 - Comprehension of Text and Graphics

Chairperson: Esther Canrinus, University of Agder, Norway

Boundary Conditions of the Seductive Details Effect: When the Perceived Relevance is Crucial

Keywords: Comprehension of text and graphics, Educational Psychology, Experimental studies, Multimedia learning

Presenting Author:Lisa Bender, University of Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Do seductive details (i.e., interesting but irrelevant adjuncts) impede learning only when the learners (mistakenly) think that they are relevant? We conducted an experiment in which students ($N = 84$) learned either (a) without seductive details (control condition), (b) with seductive details and without further information, or (c) with seductive details and initial information about their irrelevance (with respect to learning goals). As expected, seductive details hampered learning only when the learners did not receive information about their irrelevance. Extraneous cognitive load mediated the negative effects of seductive details without information about their irrelevance on learning outcomes. In summary, the present findings suggest that the perceived (ir-)relevance of seductive details is a boundary condition of the seductive details effect.

Connecting text to pictures on a tablet device – can it support learning?

Keywords: Comprehension of text and graphics, Educational Psychology, Experimental studies, Multimedia learning

Presenting Author:Anne Schueler, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Ann-Katrin Wesslein, University of Tübingen, Germany

Text-picture integration is the central assumption in learning with multimedia (Mayer, 2009). The aim of the present study was to test to what extent text-picture integration can be supported when learners are required to connect corresponding verbal information and picture elements by tracing imagery lines between both elements on a touch screen. During the learning phase, information on six fish species was presented on tablet computers. On a total of 23 pages, pictures and corresponding verbal descriptions were presented simultaneously. Learners in the tracing group were asked to trace an imaginary line with their finger on

the touch screen between a highlighted word and the corresponding element in the picture. Learners in the no-tracing group learned the same information without corresponding instructions. After the learning phase, learning outcomes were measured by means of items requiring (a) text-picture integration, (b) recall of information presented only in the text, or (c) recall of information presented only in the picture. Furthermore, learners had to draw two of the fishes. Contrary to our expectations, learners in the tracing group did not perform better than those in the no-tracing group. Instead, the latter even outperformed the tracing group regarding integration items and the drawing task. Log-file data indicated that learners in the tracing group might have had problems in tracing the correct line on every slide. In sum, tracing proved to be rather harmful for learning with text and pictures. Possible explanations will be discussed at the conference.

Cross-representational signaling fosters text-picture integration: Evidence from eye movements

Keywords: Comprehension of text and graphics, Experimental studies, Multimedia learning, Reading comprehension

Presenting Author:Erica de Vries, Université Grenoble Alpes, France; **Co-Author:**Mireille Betrancourt, University of Geneva, Switzerland; **Co-Author:**Juliette Désiron, University of Geneva, Switzerland

Learning from from a multimedia document is particularly effective if learners can link verbal and pictorial representations. Multimedia research on signaling found that inserting signals in the picture only or in both text and picture facilitated learners' integration process, and thus their comprehension of the material. Previous studies however did not distinguish comprehension of the text base from comprehension requiring inference generation (local and global). In this study (N = 47) we investigated the effectiveness of cross-representational signalling (colour cues linking text and picture information) on three levels of comprehension (text base, local inference, global inference). Online processing was analysed using eye-tracking data. Results showed no effect of conditions on comprehension, but confirmed differences in processing behaviours: in the signaling condition more attention was allocated to the pictorial representation than in the no signaling condition.

Adjunct questions with hints to pictures: Improving learning from text and pictures

Keywords: Comprehension of text and graphics, Experimental studies, Multimedia learning, Quantitative methods

Presenting Author:Julia Kollmer, University of Freiburg, Germany; **Co-Author:**Inga Frey, University of Freiburg, Germany; **Co-Author:**Alexander Eitel, University of Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

Multiple representations such as text and pictures lead to favorable learning outcomes, but only if the learners integrate the information from multiple representations into a coherent mental model constituting comprehension. The aim of this study was to test whether adjunct questions, which are a tried-and-tested support procedure in the case of learning from text only, should be best enriched with hints to pictures in the case of learning from text and pictures. A total of 102 participants were randomly assigned to one of three conditions: (a) Texts and pictures without any adjunct questions; (b) texts and pictures with adjunct questions; (c) texts and pictures with adjunct questions with an additional hint at the picture. As expected, we found that in line with our hypothesis, the learning with questions including hints at pictures was superior to learning under the other conditions. These findings imply that the design of adjunct questions should be different, depending whether learner study just text or text and pictures.

Session L 17

14 August 2019 15:30 - 17:00

Seminar Room - S04

Single Paper

Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes

Collaborative Learning

Keywords: Collaborative Learning, Computer-assisted learning, Computer-supported collaborative learning, Conversation/ Discourse analysis, Cooperative/collaborative learning, Educational Psychology, Educational technology, Higher education, Learning Technologies, Pre-service teacher education, Problem-based learning, Self-regulation

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 10 - Social Interaction in Learning and Instruction, SIG 14 - Learning and Professional Development, SIG 27 - Online Measures of Learning Processes

Chairperson: Molly Hammer, University of Tuebingen, Germany

Group work as an arena for learning in STEM education: Negotiations of epistemic relationships

Keywords: Collaborative Learning, Conversation/ Discourse analysis, Cooperative/collaborative learning, Problem-based learning

Presenting Author:Fredrik Rusk, Nord University, Norway; **Co-Author:**Wenche Rønning, Nord University, Norway

The research presented in this paper is part of a project on Newton-rooms as an arena for STEM learning. In the current paper, we focus on the analysis of video recordings of the group activities in the Newton-rooms. We analyze pupils' social interaction and social organization with a focus on cooperation and learning practices in the specific contexts of the Newton-rooms. The results of the study indicate that group work, cooperation, and the negotiation of shared pedagogical foci is not a straightforward practice when pupils organize themselves in group work. Based on five different situations, where the pupils express knowledge regarding the current assignment, and in extension affect the cooperation through said practices, we focus on describing and exemplifying how participants seem to organize their social interaction in group/pair work. When studying the situations closely, we find that there are some important factors that seem to either foster or hinder the way the pupils go about solving the task they have been given. These factors are access to physical resources, participants' expressed knowledge, participants' expressed sensitivity to co-participants' knowledge, and access to new knowledge. Through investigating group and pair work on a micro-level, we can better understand the fluidity and dynamics of group/pair work and also better pinpoint which cooperation and communication skills and strategies that might be of importance to consider as learnables, themselves, since these skills are part of the skill set that is much needed in future workplaces.

University students' perceptions of scripted collaborative writing

Keywords: Collaborative Learning, Computer-assisted learning, Computer-supported collaborative learning, Higher education

Presenting Author:Kirsi Heinonen, University of Jyväskylä, Finland; **Co-Author:**Raija Hämäläinen, University of Jyväskylä, Finland

Abstract A collaboration script is a set of instructions to improve collaboration and cognitive process among students during the learning process. In this presentation, we focus on university students' perceptions of collaborative writing when they participate in scripted collaboration activities. Moreover, our study highlights the enabling and hindering factors of collaborative writing. The study was conducted among masters' students (N=42) from a Finnish university, who were working in small groups of three to four people for collaborative writing task. Thematic analysis revealed a variety of students' perceptions concerning computer-supported collaborative writing within the scripted learning context. Four main themes were identified: *individual, group-based, script-based and activity related*. Furthermore, our findings indicate that students mainly found enabling factors to be group-based, e.g. positive atmosphere (trust, cooperative support and feeling comfortable with each other) or effective communication between group members. On the other hand, the students' perceptions revealed that hindering factors mainly were script-based, e.g. students expressed that they were confused about the script or about how to tackle the collaborative writing task. These findings can be used to design scripted collaborative writing activities in a computer-supported setting.

Physiological synchrony and group performance in collaborative problem solving

Keywords: Collaborative Learning, Computer-supported collaborative learning, Educational technology, Learning Technologies

Presenting Author:Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

Studies have shown that autonomic physiological dynamics (e.g. electrodermal activity (EDA), and heart rate) can inform about various psychosocial constructs when individuals interact with each other. Particularly, physiological synchrony (PS) has the potential to elucidate the level of socio-cognitive processes among the learners in collaborative learning settings. However, there is still little evidence on the issue. Drawing on this, the current study investigates the relationship

between PS and group performance in collaborative complex problem solving. Sixty nine graduate students participated in the study in groups of three and completed a complex problem simulation with their teammates. The data in the current study include electrodermal activity and heart rate measurements of the participants and the group performance score in the simulation. Multidimensional Recurrence Quantification Analysis was used to calculate the PS among the group members in terms of both EDA and heart rate. The study contributes to the collaborative learning research through introducing a novel method for indexing physiological data at the group level and extending the limited knowledge on the role of PS on group performance.

Where's the spark for group-level regulation in musical tasks?

Keywords: Collaborative Learning, Educational Psychology, Pre-service teacher education, Self-regulation

Presenting Author:Tarja-Riitta Hurme, University of Turku, Finland; **Co-Author:**Marjaana Puurtinen, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Hans Gruber, University of Regensburg, Germany

Research on group-level regulatory processes has shown the importance of the interdependence of group members and of the shared goal towards which the group members constantly monitor their collaborative work. Little is known, however, how simultaneous individual contributions to group processes may explain the emergence of group-level regulation. The aim of this study is to identify triggers for group-level regulation in a collaborative musical task through detailed analyses of (1) adult learners' and trained music educator's musical activities and verbal interaction and (2) the gaze targets of the music educator (one learner, two learners, or the musical score). Three groups of one trained music educators and two pre-service elementary school teachers prepared an arrangement to an unfamiliar song to be used at an elementary-school music lesson. During the 45-minute task, the music educator wore head-mounted Tobii Glasses to record his/her eye movements, and the whole scene was recorded with a digital camera and two iPads. For the logistic regression analysis, group-level regulation was predicted by the following covariates: musical activities, verbal interaction, and music educator's gaze targets. First analyses indicate that music educator's gaze target on the musical score, and on a more knowledgeable student, as well as the questions the educator proposed predicted group-level regulation. Final results will be presented at the conference. The results of the study could be used to train future music educators to consciously use verbal interaction and gaze targets to guide and scaffold collaborative music making and regulation of joint activities.

Session L 18

14 August 2019 15:30 - 17:00

Seminar Room - S06

Single Paper

Higher Education, Instructional Design, Motivational, Social and Affective Processes

Secondary Education

Keywords: Attitudes and beliefs, Competencies, Higher education, Literacy, Meta-analysis, Motivation, Quantitative methods, Reading comprehension, Science education, Secondary education, Teacher Effectiveness

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 18 - Educational Effectiveness

Chairperson: Anett Wolgast, Martin-Luther-Universität Halle-Wittenberg, Germany

Feeling the strain: Investigating changes in science attitudes and career aspirations from age 10-19

Keywords: Attitudes and beliefs, Motivation, Quantitative methods, Science education

Presenting Author:Julie Moote, University College London, United Kingdom; **Co-Author:**Louise Archer, Institute of Education, Univeristy College London, United Kingdom

There are widespread national and international concerns that not enough young people are continuing with science post-16. As attitudes towards science have been found to be a strong predictor of performance outcomes and STEM participation post-16 (e.g. Hattie, 2009), these trends are worrying for science educators. Further, in a meta-analysis of studies looking into student interest and attitudes towards science, Awan and colleagues (2011) found that students in developed countries showed lower interest and less positive attitudes in science than students in developing countries. Therefore these issues are extremely relevant for the Western world. This paper presents findings from ASPIRES, a ten-year project aiming to understand the processes through which students develop their science and career aspirations between the ages of 10 and 19. Through comparing the results from two large-scale surveys of a nationally representative sample of the cohort (Year 6 students aged 10/11, n=9,319; Year 13 students aged 17/18, n=7,013), this research explores shifts in attitudes and aspirations in science. Further multivariate analyses investigating possible predictors (i.e. student attitudes towards school science, engagement in science-related activities outside of school, parental attitudes to science, science capital and self-concept in science) of students' aspirations in science will also be presented.

An overview of meta-analyses in STEM education:Analysis of scientific quality and moderating effects

Keywords: Meta-analysis, Quantitative methods, Secondary education, Teacher Effectiveness

Presenting Author:Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:**Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

In the field of learning and instruction research syntheses are key scientific contributions guiding further development in research and practice. Since Seidel & Shavelson (2007) and Hattie (2009) published their seminal syntheses, research on teaching effectiveness is expanding rapidly. Despite efforts to promote quality standards, researchers have noted wide variation in reporting and employing methodologies in published meta-analyses. To further promote a systematic and reliable practice of reporting and conducting meta-analyses on teaching effectiveness, we first reviewed literature and developed an updated, state-of-the-art rating scheme of scientific quality criteria. Second, we identified a coherent set of 37 recent meta-analyses on effective STEM teaching and analysed to what extent current meta-analyses meet the requirements of scientific quality criteria and to what extent moderator analyses are conducted in a systematic manner. Overall, our results show that transparency and methodological rigor (scientific quality) has improved (e.g. analysis of publication bias), but some crucial issues are still insufficiently addressed (e.g. power analysis). Although moderator analysis has become a default practice, results show large variations in the number of investigated moderators and no systematic coverage of fundamental categories. All in all, this contribution provides a thorough analysis of current meta-analytic practice in teaching effectiveness research and may help to foster scientific quality including the systematic testing of moderator effects in teaching effectiveness research.

Predicting Students' Drop out Behavior in Economics: When Economic Competencies matter

Keywords: Competencies, Higher education, Quantitative methods, Secondary education

Presenting Author:Michael Jüttler, University of Konstanz, Germany

Various countries have put an increasing focus on implementing and increasing economic education in upper secondary school. Economic competencies are crucial for individuals to take part and participate in increasingly connected global economic systems. In higher education, economics and business administration represents the largest field of study worldwide. However, up to now only little research exists on how competencies acquired in these subjects are related to academic success. This study provides analyses on basis of longitudinal data of N = 147 Swiss high school students' economic competencies and drop out behaviours when studying economics or a related field. Based on the Students Integration Model by Tinto (1993) and the Students Attrition Model by Bean (1982), results show that economic knowledge and skills can be identified as a main predictor of students' academic but not of students' social integration. Academic and social integration, in turn, represent important mediators for students' retention in economics or a related field. However, psychological facets of economic competencies (motivation, attitude and value-oriented dispositions) showed no effects. Practical implications are discussed. With respect to long range effects of economic competencies, these data are unique and offer first results in this matter.

Adaptive literacy Instruction to enhance literacy skills and reading motivation in 7th graders.

Keywords: Literacy, Motivation, Reading comprehension, Secondary education

Presenting Author:Mienke Droop, Radboud University, Nijmegen, Netherlands; **Co-Author:**Femke Scheltinga, ITTA, University of Amsterdam, Netherlands; **Co-Author:**Liza van den Bosch, Radboud University, Netherlands; **Co-Author:**Christel Dood, National Center for Language Education, Netherlands; **Co-Author:**Nicole Heister-Swart, National Center for Language Education, Netherlands; **Co-Author:**Eliane Segers, Radboud University Nijmegen / University of Twente, Netherlands

The present study aimed to examine the effects of adaptive literacy-motivational instruction on reading abilities and reading motivation of low achieving seventh graders in the prevocational educational track of secondary school. The study was conducted in the Netherlands among 491 students of seven schools for secondary education (experimental group $n=267$; control group $n=224$). Teachers were randomly assigned to either the experimental or control group. The intervention was conducted from February to June 2017-2018. Measurements of reading comprehension and reading motivation skills took place before and after the intervention period. Repeated measures analyses (GLM) showed positive effects on reading comprehension and reading motivation. For reading comprehension, the experimental group improved more over time than the control group. For reading motivation, in the experimental group the scores remained stable over time, whereas in the control group it was found that students reported more reading avoidance and less reading pleasure. Students also reported that they had appreciated autonomy and free reading time. Thus, better and broader knowledge of reading profiles of students may help teachers to better tailor their education to the needs of their students and this may positively influence reading motivation and reading comprehension.

Session L 19

14 August 2019 15:30 - 17:00

Seminar Room - S07

Single Paper

Teaching and Teacher Education

Developing Teacher Education for the Future

Keywords: Conceptual change, Higher education, Meta-analysis, Pre-service teacher education, Problem-based learning, Quasi-experimental research, Science education, Secondary education, Teacher Effectiveness, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Shiyu Liu, China

Voices from the Frontline: What Teacher Educators Know and Believe about Evidence-Based Teaching

Keywords: Higher education, Pre-service teacher education, Teacher Effectiveness, Teacher professional development

Presenting Author: Despoina Georgiou, Ludwig Maximilian University, Germany; **Co-Author:** Anne Wiesbeck, TUM School of Education, Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany

Research on evidence-based practices in medicine has shown that knowledge, beliefs and attitudes play a pivotal role in the acceleration of implementation of Evidence-based practices (EBP). In education, this topic has received little attention within the literature despite the high demand by European educational reforms for the use of research evidence into teaching practice. Because teacher educators play a crucial role in the classroom ecology of teacher education, a consistent use of Evidence-based teaching practices (EBTs) in this field is especially important and may accelerate a more rapid shift toward EBTs. The aim of this study is to report on teacher educators' knowledge, beliefs and attitudes toward EBT, the potential differences between novice and expert teacher educators and the challenges they face when it comes to the implementation of Evidence-based teaching. Teacher educators ($N = 204$) from all over Germany, Austria and Switzerland completed the Evidence-based teaching scale, developed by the authors of the study. The results reveal good internal consistency for all three scales (ranging between Cronbach's $\alpha = .78$ and $.83$). Multiple regression analysis yielded statistically significant differences between expert and novice teacher educators based on their academic rank while four major challenges were identified. Implications and future steps that are necessary to increase the implementation of Evidence-based teaching practices in teacher education will be discussed.

Pre-Service Teachers' Use of Learning Progressions: Contribution to Research-Based Teacher Education

Keywords: Conceptual change, Pre-service teacher education, Science education, Secondary education

Presenting Author: Alicia Alonzo, Michigan State University, United States; **Co-Author:** Michelle Wooten, Michigan State University, United States

Teacher education focused on *high leverage practices* is a research-based approach, designed to ensure that novices enter the classroom prepared to teach. However, little research has been conducted to inform strategies for integrating requisite support for novices' knowledge development into practice-focused teacher education. This study is an initial exploration of one such strategy with 14 science pre-service teachers (PSTs). The PSTs were enrolled in a practice-focused methods course, in which they engaged in three *micro-teachings*, opportunities to teach lesson segments to their peers. *Learning progressions* (LPs)—“descriptions of the successively more sophisticated ways of thinking about a topic that can follow one another as children learn” (National Research Council, 2007, p. 219)—were introduced to support the practices of eliciting, responding to, and assessing pupils' ideas. We examine evidence of PSTs' use of the LPs for planning, enactment, and reflection using post-micro-teaching interviews, focused on planning rationales and consideration of pupils' ideas in micro-teaching video clips, and written reflection assignments. PSTs used the LPs to notice and/or make instructional decisions based on pupils' ideas and to highlight ideas particularly relevant for supporting progress towards learning goals. However, there was significant variation across PSTs, which seemed at least partially explicable by a) alignment between the LPs and PSTs' assigned content standards, b) PSTs' ability to identify focus phenomena aligned to assigned standards, and c) individual PSTs' orientation towards pupils' ideas. Implications for refinement of the practice-focused model of teacher education—as an example of research-based teacher education—will be discussed.

Looking for potential: How student selection predicts student teachers' achievement?

Keywords: Higher education, Pre-service teacher education, Teacher Effectiveness, Teacher professional development

Presenting Author: Marko Lähteenmäki, University of Turku, Finland; **Co-Author:** Mirjamaija Mikkilä-Erdmann, University of Turku, Finland; **Co-Author:** Anni Holmström, University of Turku, Department of Teacher Education, Finland; **Co-Author:** Anu Warinowski, University of Turku, Finland

The aim of this pilot study is to find research-based rationale for future classroom teacher selection. First, we examine how high-level student teachers' matriculation exams predict their study success during a five-year university degree program in classroom teacher education. Two study cohorts (2010 and 2013) were chosen from the Department of Teacher Education at the University of Turku ($N=158$). High-level matriculation exam and entrance exam scores predict high-level study success. There is an ongoing pressure and need for a research-based development of selection methods, as well as standardised selection processes and valid criteria for teacher education in Finland and other countries (Darling-Hammond, 2017; Clinton & Dawson, 2018). Our results indicate that there is evidence for a two-phase selection; however, future studies must identify different student profiles to develop research-based student selection in a cumulative way.

Replication study: Training diagnostic competence using problem-based learning with text-based cases

Keywords: Meta-analysis, Pre-service teacher education, Problem-based learning, Quasi-experimental research

Presenting Author: Alexander Wedel, TU Berlin, Germany; **Co-Author:** Christin R. Müller, Independent researcher, Germany; **Co-Author:** Jan Pfetsch, TU Berlin, Germany; **Co-Author:** Angela Ittel, TU Berlin, Germany

The increasing amount of heterogeneity in schools poses a challenge for developing diagnostic competence in teacher education. Previous intervention studies demonstrate that case-based learning can effectively promote teacher's diagnostic competence. However, these interventions primarily focus on individual learning, e.g. with structured diaries, and have not been replicated yet. However, the focus on individual learning does not take into account the professional community and interactive diagnostic activities. Therefore, our two studies examined the effects of problem-based learning with text-based cases on pre-service teachers' diagnostic competence. We hypothesized that problem-based learning with text-based cases has a positive effect on knowledge, motivation, and the self-concept. The present studies are pre-post quasi-experimental intervention studies. In the first study, 57 students participated in the first and 43 students in

the second measurement point. In the second study, 65 students participated in the first and 58 students in the second measurement point. Participants completed a knowledge test on pedagogical diagnostics and self-report questionnaires on the motivation for pedagogical diagnostics and the diagnostic self-concept. Repeated-measures ANOVAs showed significant intervention effects on knowledge (recognizing facts, understanding, applying) and the self-concept. However, in the first study, there was an effect on understanding and applying, while in the second study there was an effect on recognizing facts. Meta-analytic fixed-effect models showed substantial intervention effects for all measured constructs, except for motivation. We discuss the results and possible reasons for the differences between the two studies with respect to promoting diagnostic competence in teacher education and designing problem-based learning environments.

Session L 20

14 August 2019 15:30 - 17:00

Seminar Room - S16

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools in Higher Education

Keywords: Assessment methods and tools, Competencies, Higher education, Motivation, Qualitative methods, Self-regulation, Student learning, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Sanna Väisänen, University of Eastern Finland, Finland

Mechanisms of effective feedback: a realist synthesis of feedback interventions

Keywords: Assessment methods and tools, Higher education, Motivation, Student learning

Presenting Author:Rola Ajjawi, Deakin University, Australia; **Co-Author:**Margaret Bearman, Deakin University, Australia; **Co-Author:**David Boud, University of Technology Sydney/ Deakin University, Australia; **Co-Author:**Jaclyn Broadbent, Deakin University, Australia; **Co-Author:**Fiona Kent, Monash University, Australia; **Co-Author:**Joanna Tai, Deakin University, Australia

Background: Feedback remains poorly perceived by students in higher education, despite multiple reviews identifying best practice models and processes. Simplified messages about the requirements for effective feedback fail to account for the diversity of learners, contexts and educational tasks. A realist review of the higher education feedback literature was conducted to analyse contexts, mechanisms and outcomes associated with successful feedback interventions, to inform the design of local practices. Method: Initial theories from which to analyse the data were drawn from the social and psychological literature: self-regulated learning, self-determination theory and education alliance. After initial scoping in Google Scholar, a formal search of multiple databases was undertaken for primary research publications investigating feedback interventions on assignments, projects or essays. Interventions involving faculty and undergraduate learners were the focus. Findings: A total of 10,332 potential articles were screened, 355 full text articles analysed, and 55 considered in the final analysis. Analysis suggests that sense of connection in the early years is associated with improved self-efficacy and engagement with feedback; the important role of learner-teacher dialogue and scaffolded tasks in developing evaluative judgment; and the emotional interplay with perceptions of self-efficacy. Discussion: Self-determination theory was the best fit in terms of explaining the mechanisms underlying effective feedback, for whom and under which circumstances. Attending to learners' sense of relatedness, competence, and autonomy may be conducive to effective feedback processes.

The patterns of self-assessment in different phases of the learning process

Keywords: Assessment methods and tools, Higher education, Self-regulation, Teaching/instruction

Presenting Author:Zi Yan, The Education University of Hong Kong, Hong Kong

The present study aimed to investigate the patterns of self-assessment practices at different phases of self-regulated learning (SRL) and the associated effects on learning outcomes. Sixty-three master students enrolling in a teacher education institute responded to an instrument assessing their self-assessment practices at the Preparatory, Performance, and Appraisal phases of SRL respectively. Their self-rating scores and final scores of the assignment were also collected. The results showed that self-assessment is a fundamental skill for SRL and occurs at the each phase of SRL with different patterns. Self-directed feedback seeking via monitoring at Preparatory phase was positively and significantly related to the academic performance. No other self-assessment actions demonstrated a significant correlation with academic performance.

How Do Personal Beliefs Affect the Critical Dealing with Information in a Performance Assessment?

Keywords: Assessment methods and tools, Competencies, Higher education, Student learning

Presenting Author:Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Jana Jurisch, Lehrstuhl für Wirtschaftspädagogik Johannes Gutenberg Universität Mainz, Germany; **Co-Author:**Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Susanne Schmidt, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Richard Shavelson, Stanford University, United States; **Co-Author:**Klaus Beck, Johannes Gutenberg-Universität, Germany; **Co-Author:**Dimitri Molerov, Humboldt-University Berlin, Germany

We present an innovative approach to assessing higher education students' critical thinking by simulating real-life decision-making. Here, we focus on the question to what extent personal beliefs (regarding the scenario topic in a performance task) affect students' processing of information presented in the task and decision-making. To this end, a newly developed performance task, semi-structured cognitive interviews and a questionnaire were presented to 30 advanced bachelor and master students and their test performance in a total of 23 categories in five dimensions of the theoretically defined construct *critical thinking* was scored by two trained raters each using a newly developed 6-point Likert-type anchored rating scheme. We identified three types of participants for whom personal beliefs had a different impact on decision-making and written responses: (1) One group ignored given information and decided solely based on their personal beliefs, (2) one group decided contrary to their personal beliefs by changing their decision after reading certain information presented in the task and (3) one group made the decision after considering "for" and "against" arguments based on their personal beliefs rather than on the given information. Remarkably, the participants of the last group achieved the highest score in the performance task compared to the other groups - also under control of relevant domain-specific knowledge. The three identified types indicate that the impact of personal beliefs on participants' decision-making process differed depending on the interplay with their mental processing of given information. Here, personal beliefs play a stronger role than available domain-specific knowledge.

Course designs that cater for productive feedback: exploring feedback in practice

Keywords: Assessment methods and tools, Higher education, Qualitative methods, Teaching/instruction

Presenting Author:Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:**Monika Nerland, University of Oslo, Norway; **Co-Author:**Crina Damsa, University of Oslo, Norway

Feedback on student work is considered as one of the most productive ways of supporting students in their own learning. This makes it increasingly important for teachers to carefully plan for productive feedback as part of their course designs. To that end, this study explores the ways feedback opportunities are incorporated in two course designs from different disciplines and what might contribute to making feedback in these designs productive. It draws on a sociocultural conceptualization of feedback as a social practice that emerges from the different relations between course elements such as people, tasks, knowledge contents and materials. Based on this idea, it is argued that pedagogical designs play a central role for the way course elements are arranged and, thereby, what kind of opportunities for productive feedback are created in a course. Using data from two case studies of higher education courses in Norway, a thematic analysis of course documents and teacher interviews revealed that the two designs catered for productive feedback in different ways. The designs were informed by discipline-specific practices that influenced three aspects that mattered for productive feedback: the planned relation of feedback to task organization; the planned distribution of responsibilities for feedback; and the degree of flexibility in negotiating these task organization and responsibilities. Our findings suggest that teachers should see productive feedback as an integral part of their course designs and need to consider the practices of their disciplines

in their planning process.

Session L 21

14 August 2019 15:30 - 17:00

Seminar Room - S15

Single Paper

Culture, Morality, Religion and Education, Teaching and Teacher Education

Cultural Diversity, Attitudes and Beliefs

Keywords: Argumentation, Attitudes and beliefs, Cultural diversity in school, Educational attainment, Emotion and affect, History, Motivation, Multicultural education, Science education, Self-efficacy, Teacher professional development, Teaching approaches

Interest group: SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Malba Barahona, Chile

Primary School Teachers' Personal Resources and the Quality of Inclusive Learning Processes

Keywords: Attitudes and beliefs, Motivation, Self-efficacy, Teacher professional development

Presenting Author: Gamze Goerel, Paderborn University, Germany; **Co-Author:** Frank Hellmich, Paderborn University, Germany

Within the frame of implementing inclusive education at primary schools, various questions arise concerning the role of teachers' personal resources for their views on quality features of inclusive learning processes. Teachers' professional personalities as well as their estimations concerning the quality of inclusive teaching represent important prerequisites for successful inclusive learning environments. In our study, we examined N=168 primary school teachers' personal resources and their prospective views on quality features of inclusive learning processes. As primary school teachers' personal resources, we take into account their attitudes towards inclusion, their self-efficacy beliefs concerning the implementation of inclusive learning processes and their motivation to deal with inclusive issues. Primary school teachers' prospective views on quality features of inclusive learning processes were operationalized in our study by four variables: dealing with heterogeneity, structuring the subject matter, clarity and encouraging atmosphere in the classroom. The results of our study indicate that on the one hand teachers' intrinsic motivation to deal with inclusive issues is predicted by their self-efficacy beliefs and their attitudes towards inclusion. On the other hand, the results illustrate that teachers' estimations of dealing with heterogeneity are explained by their intrinsic motivation. Furthermore, teachers' prospective view on dealing with heterogeneity is a significant predictor for their views on structuring the subject matter, the clarity and an encouraging atmosphere in the inclusive classroom.

Mathematics and science teacher's voice on argument based teaching and learning

Keywords: Argumentation, Attitudes and beliefs, Science education, Teaching approaches

Presenting Author: Ida Kukliansky, Ruppin Academic Center, Israel

The aim of this paper is to examine mathematics and science teacher's attitudes toward argument based teaching and learning. For this purpose a research tool of three parts was build. In Part A the participants were asked to provide their demographical information. Part B provided three examples of argumentation teaching. Part C was the actual questionnaire which was composed of 29 statements. The statements were divided into three categories: a) student's benefits from argument based teaching b) confidence of the teachers in using argument based teaching c) technical issues relating to argument based teaching and learning. The participants of this study were 335 mathematics and science teachers. The results of this study show that teachers hold both positive and negative views simultaneously toward argument based teaching and learning, while most of them held more positive attitudes than negative ones. Comparing between the males and females attitudes showed no significant differences in the means of most of the items and higher female attitudes in the others, meaning that women are less conservative to argument based teaching. It is not surprising that the attitudes of teachers participating in the training are higher, meaning that training helps the teachers to understand the benefits of this method.

Silences in a climate of voicing: Teachers' perceptions of silencing sensitive historical issues

Keywords: Cultural diversity in school, Emotion and affect, History, Multicultural education

Presenting Author: Geerte M. Savenije, University of Amsterdam, Netherlands; **Presenting Author:** Tsafir Goldberg, University of Haifa, Israel

This study explores the silencing and voicing of sensitive topics in history education in a cross national and multilevel perspective. In this mixed-method study, we used quantitative analysis of a teaching sensitive issues questionnaire to identify sensitive issues. Qualitative analysis of history curricula and teachers' verbal responses was used to trace societal silencing and teachers' perceptions of self-silencing. Findings show that most respondents are aware of societal and self-silencing but are also committed to voicing and giving voice to students. Focusing on the issues found to be most sensitive - immigration and Islam - in the countries where they were most frequently mentioned (Germany, Austria, France, Italy, The Netherlands and Israel), analysis of national curricula indicates a climate of "voicing" rather than silencing. Analysis of teachers' responses showed a strong awareness of the relationship between the sensitivity of the history of immigration and that of Islam, and the relation between student diversity and self-silencing of these issues. It appears that in some cases apprehension of students' voices led teachers to self-silencing.

Match of Acculturation Orientations of Teachers and Students and Students' Educational Success

Keywords: Attitudes and beliefs, Cultural diversity in school, Educational attainment, Multicultural education

Presenting Author: Andrea Haenni Hoti, University of Teacher Education of Lucerne, Switzerland; **Presenting Author:** Christine Wolfgramm, University of Teacher Education Zurich, Switzerland; **Co-Author:** Marianne Müller, Institute for Diversity Education, University of Teacher Education, Switzerland, Switzerland; **Co-Author:** Buholzer Alois, Institute for Diversity in Education, Switzerland

Schools are considered to constitute the main acculturation context for immigrant children and youth. Accordingly, there is a long-standing research tradition investigating the impact of different acculturation orientations of immigrant students on their school adjustment. However, little is known about the effect of (mis-)matching acculturation orientations between immigrant students and their teachers. This longitudinal study with two measurement points (grades 5 and 6) examined the acculturation orientations of the students and their class teachers and how the match or mismatch regarding these affects the quality of the teacher-student relationship and the school adjustment of the students. The sample consists of 60 primary school classes in Switzerland (n=1112 students and 60 teachers). The data were analysed using multilevel and multiple regression analysis, taking into account a large amount of demographic, school-related, psychosocial and acculturation-related factors. As expected, matching acculturation orientation were related to a better relationship between teacher and student from the teacher's perspective. Conversely, a mismatch concerning the perception of the student's cultural affiliation predicted a lower quality of relationship from the student's perspective. Moreover, matching multicultural orientations were also related to students' higher educational aspirations. However, a relation between the match of acculturation orientations and the students' school satisfaction, academic self-concept and performance in a German language test could not be shown. However, the match of acculturation orientations indirectly affected academic adaptation via the quality of the relationship between students and their teachers.

Session L 22

14 August 2019 15:30 - 17:00

Seminar Room - S02

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes

Parental Involvement in Learning

Keywords: At-risk students, Attitudes and beliefs, Developmental processes, Early childhood education, Language (Foreign and second), Language (L1/Standard Language), Literacy, Meta-analysis, Motivation and emotion, Parental involvement in learning, Student learning
Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 21 - Learning and Teaching in Culturally Diverse Settings
Chairperson: Stefan Ufer, Ludwig-Maximilians-Universität (LMU), Germany

Differences between fathers and mothers in shared reading interactions: effects of child gender

Keywords: Early childhood education, Language (L1/Standard Language), Literacy, Parental involvement in learning
Presenting Author: Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:** Sanneke de la Rie, Rotterdam University of Applied Sciences, Netherlands; **Co-Author:** Kim Vlot, Erasmus University Rotterdam, Netherlands; **Co-Author:** Nicole Lucassen, Erasmus University Rotterdam, Netherlands

Over the past years, researchers have become increasingly interested in the role of fathers in children's early literacy development. Studies have shown differences in the types of interactions fathers and mothers engage in with their child during shared reading (Varghese & Wachen, 2015). A question that has been hardly explored is whether there is an interaction effect of parent gender and child gender (Vandermaas-Peeler, Sassine, Price, & Brillhart, 2012). Therefore, the current study examined whether fathers and mothers differ in the way they read to their daughters and sons. Preliminary analyses revealed no significant main effects of parent gender and child gender on the nature of parent-child interactions. However, the interaction of parent gender and child gender revealed a trend, which implied that fathers used more decontextualized talk with daughters than with sons, whereas there was no such difference for mothers. In our presentation we present outcomes based on a larger sample and additionally include analyses of child utterances. The insights from our study might contribute to the design of family literacy interventions that involve both mothers and fathers.

Students' and parents' beliefs about failure and control matter: reducing the failure dynamic.

Keywords: Attitudes and beliefs, Motivation and emotion, Parental involvement in learning, Student learning
Presenting Author: Elizabeth R Peterson, University of Auckland, New Zealand

The negative consequences of failure and failure dynamics (anxiety, performance avoidance, self-handicapping and disengagement) are well established (Martin et al., 2015). While, growth mindsets (believing you can learn and grow from mistakes and failures, and being adaptability to setbacks) have been argued to influence failure and failure dynamics, the mechanisms underlying these associations have been less explored. In a sample of 220 university students we found that control beliefs were an important mediator of growth mindsets, adaptability to failure, beliefs about learning from errors and the failure dynamics. That is, a adaptability, growth mindsets, and beliefs that failure is important for growth positively predicted control, and control in turn was associated with reduced failure dynamics. In addition, parents' beliefs about the importance of failure for learning and growth positively predicted students' failure beliefs and students' adaptability beliefs, but did not influence their growth mindsets. Our findings help highlight some of the mechanisms underlying the failure dynamic and suggest areas that could be focused on when researchers, parents and teachers are trying to enhance adaptability to failure, growth mindsets, positive beliefs about learning from failure, and when they are seeking to reduce the failure dynamic.

Effects of family literacy programs for at-risk children: A meta-analysis

Keywords: At-risk students, Literacy, Meta-analysis, Parental involvement in learning
Presenting Author: Suzanne Fikrat-Wevers, Erasmus University Rotterdam, Netherlands; **Co-Author:** Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:** Wichor Bramer, Erasmus MC, Netherlands; **Co-Author:** Lidia Arends, Erasmus University Rotterdam, Netherlands

Family literacy programs (FLPs) intend to stimulate children's literacy development through family involvement. These programs are particularly relevant for children who are at risk for lower academic achievement (e.g., children from low-income and/or immigrant families): because these children often enter school with limited emergent literacy skills, intervening in the preschool phase by means of home-based activities could be beneficial. A number of meta-analyses have been conducted on the effects of FLPs. However, conclusions of these meta-analyses are based on the average outcomes of both at-risk and non-at-risk samples: what works specifically for at-risk children is, as yet, unclear. Such information is important because program effects might be context-dependent (what works for one group of families does not necessarily work for another group). The goal of the present meta-analysis is to examine the effects of family literacy programs on the literacy competencies of at-risk children. The meta-analysis covers 55 recent effect studies (1990-2018) involving family literacy interventions aimed at preschool children (0-6 years) with a majority of at-risk children (based on socio-demographic indicators or an observed language delay). Additionally, moderator analyses are conducted to reveal whether relevant intervention, sample and study characteristics explain possible variance in effects between studies. Potentially relevant intervention characteristics are the didactic approach of the programs, the language of the materials and training, and the intervention context. Potentially relevant sample and study characteristics are, respectively, at-risk criterion and study design.

Parent-child book-sharing in immigrant families and children's first-language development

Keywords: Developmental processes, Early childhood education, Language (Foreign and second), Parental involvement in learning
Presenting Author: Veslemøy Rydland, University of Oslo, Norway; **Co-Author:** Vibeke Grøver, University of Oslo, Norway

Little is known about how quality features of parent-child interactions in immigrant families relate to their children's first-language (heritage-language) development. The present study investigated book-sharing interactions in a sample of 101 dual-language learners (age 3-5) and their parents in Norway. Audio recordings of parent-child book-sharing in the first language were collected in the beginning of the preschool year and transcribed by bilingual research assistants. Based on a narrative coding scheme (Kuchirko et al., 2015), parental support was identified as either narrative statements (storytelling) or narrative questions (attempts to elicit the child's storytelling). Child-receptive vocabulary and narrative comprehension data were collected in the beginning and end of the preschool year. Results from multilevel analyses revealed that parental narrative questions—but not narrative statements—predicted child vocabulary and narrative skills in the end of the preschool year (controlling initial skill levels and relevant demographic factors). These findings suggest that how much parents encourage the children themselves to think about and explain the storyline during book-sharing is important for young dual-language learners' development in the first language.

Session M 1

15 August 2019 08:30 - 10:00
Lecture Hall - H04 - Knorr-Bremse Hörsaal
Symposium

Studying student engagement in authentic learning settings: Measurement, prerequisites, consequences

Keywords: Achievement, Assessment methods and tools, Mixed-method research, Motivation, Neuroscience, Secondary education, Social interaction, Student learning, Teaching/instruction, Video analysis
Interest group:
Chairperson: Sebastian Korinth, Goethe University Frankfurt; Institute of Psychology, Germany
Organiser: Franziska Baier, Goethe-Universität Frankfurt, Germany
Organiser: Mareike Kunter, Goethe-Universität Frankfurt, Germany
Discussant: Julien Mercier, University of Quebec in Montreal, Canada

Student engagement in the classroom is a complex construct as it is comprised of behavioral, emotional and cognitive facets (Fredricks et al., 2004). In the present symposium we account for this complexity and show how the different components of student engagement may be measured in innovative ways and how engagement is related to student characteristics, characteristics of the learning environment and student outcomes. Measuring different components of student engagement in authentic learning settings is challenging as engagement is a learning process variable rather than an outcome variable. In order to not interfere with the learning process, measures of student engagement must be carefully chosen. This symposium presents approaches to investigate

engagement by means of a variety of unobtrusive measures such as portable EEG devices, watch-like wristbands (electrodermal activity), video recording, and post-hoc self-report. Thus, our symposium points out different ways of how student engagement may be reliably and validly assessed in research and educational practice. Investigating student engagement is of high educational relevance as it may indicate why some students do benefit from a specific learning environment and others do not. Solely looking at academic learning outcomes provides little information about how and why learning takes place. In-depth information on learning processes, however, helps researchers and educators design more effective and powerful learning environments.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence *Review of Educational Research*, 74, 59–109. doi: 10.3102/00346543074001059

Hand-raising and successful learning. Relations to cognitive engagement and academic achievement.

Presenting Author: Ricardo Böheim, Technical University of Munich, Germany; **Co-Author:** Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:** Tina Seidel, Technische Universität München, Germany

Student hand-raising is an everyday behavior in classroom interactions with teachers. Despite this fact, research on student hand-raising is scarce and it remains unclear how this behavior is linked to student learning. The present study examines the relationship between student hand-raising, cognitive engagement and academic achievement. For this purpose, we investigated the hand-raising behavior of $N = 375$ high school students during a videotaped lesson. Results reveal that the extent to which students report to be cognitively engaged is positively related to the frequency of their hand-raising. Furthermore, student hand-raising has a predictive effect on subsequent academic achievement. Results from structural equation modeling (SEM) show that student hand-raising mediates the effect of cognitive engagement on academic achievement. In summary, our findings show that student hand-raising is an indicator of cognitive engagement and plays an important role in the interplay between cognitive engagement and achievement. Our results highlight the educational significance of student hand-raising in the context of student learning processes.

Situational engagement in emotionally supportive classrooms

Presenting Author: Sanni Pöysä, University of Jyväskylä, Finland; **Co-Author:** Kati Vasalampi, University of Jyväskylä, Finland; **Co-Author:** Joonas Muotka, University of Jyväskylä, Finland; **Co-Author:** Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:** Anna-Maija Poikkeus, University of Jyväskylä, Finland

Prior research has shown that engagement plays a significant role in students' academic learning. The present study sought to expand the current understanding of students' engagement by examining how situational engagement during a particular lesson is associated with emotional support observed in teacher-student interaction during the same lesson. The participants were 709 Grade 7 students (371 boys; 338 girls), and 51 teachers. The data consisted of 155 video-recorded lessons from which the emotional support in teacher-student interaction was coded with Classroom Assessment Scoring System – Secondary (CLASS-S) observational instrument, and students' self-ratings of their situational engagement collected with mobile-based InSituations (InSitu) Instrument at the end of each video-recorded lesson. The data were analyzed with cross-classified two-level hierarchical modelling. The results indicated that emotional support in teacher-student interaction is positively related to students' situational emotional engagement and help-seeking. The results also showed that girls benefitted more from high emotional support than boys for their situational emotional engagement. Overall, findings highlighted the importance of emotionally supportive learning environments.

Leveraging a wearable electrodermal activity sensor to study engagement in a physics course

Presenting Author: Héctor Javier Pijera Díaz, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Paul A. Kirschner, Open University of the Netherlands, Netherlands

Engagement involves a degree of physiological activation, referred to as arousal, concomitant with cognition, affect, and behavior. The aim of this study was to explore aspects of engagement in the classroom from the arousal perspective. Using a wristband biosensor, electrodermal activity (EDA), an indicator of arousal, was measured in 24 high school students over a physics course consisting of 18 lessons, 75 min each, plus an exam. Arousal was operationalized by the number of skin conductance responses (nSCR) of the EDA signal on a lesson basis. The nSCR showed a large variation across lessons, spanning from a couple of hundreds to a couple of thousands, thus proving a high sensitivity. Statistically significant ($p = .018$) gender differences in the nSCR were found. No connection was found between the nSCR and a more traditional and widely used engagement measure such as the students' score on the Motivated Strategies for Learning Questionnaire. On the course exam, the nSCR correlated ($r = .66$) with the students' learning outcomes as measured by their exam grades. The findings highlight the value of the nSCR parameter of the EDA signal for the advancement of engagement research, as it affords a highly sensitive measure connected to learning outcomes. Moreover, wearable biosensors conveniently enable the unobtrusive, continuous, and real time measures of engagement in physiological terms. This study takes a step forward in advancing the tools for engagement research, which is ultimately aimed at instructional recommendations for learning contexts that effectively engage students, and timely teacher interventions.

Effects of content relevance and student traits on engagement as measured by EEG alpha band activity

Presenting Author: Franziska Baier, Goethe-Universität Frankfurt, Germany; **Co-Author:** Sebastian Korinth, Goethe University Frankfurt; Institute of Psychology, Germany; **Co-Author:** Christian Fiebach, Goethe University Frankfurt, Germany; **Co-Author:** Mareike Kunter, Goethe-Universität Frankfurt, Germany

Creating meaningful learning tasks is an important predictor of students' situational and individual interests and their cognitive learning outcomes (Assor et al., 2002). Highly relevant learning tasks may foster students' attention to and engagement with the learning content and thus increase their learning outcomes (Hidi, 2001). In an experimental study, we investigated students' cognitive engagement by means of portable EEG devices throughout a video lecture and analyzed the role of the relevance of the learning content and individual student characteristics played in student engagement. In total, 33 psychology students participated, 17 of whom listened to a lecture on logarithms, highlighting their relevance for psychology, while 16 listened to a lecture not explicating this relevance. In the pre-test we assessed students' knowledge on logarithms, their interests and their learning goal orientation. In the post-test we assessed students' knowledge, their situational interest and their ease in following the lecture. Throughout the lecture we recorded students' electrophysiological brain activity. High EEG alpha activity has been shown to be associated with low attention/engagement (Foxe & Snyder, 2011). We found that students in the high-relevance condition reported higher situational interest but did not show higher levels of knowledge or cognitive engagement. Across participants, students reporting higher interest in psychology and higher learning goal orientation showed higher cognitive engagement (lower EEG alpha activity). Furthermore, the easier students found understanding the lecture, the less engaged they were (higher alpha activity). Our findings have implications for instructional design decisions and the theoretical and empirical conception of engagement.

Session M 2

15 August 2019 08:30 - 10:00
Lecture Hall - H06 - Amazon Hörsaal
Symposium
Teaching and Teacher Education

The Relation between Teacher-Student Interaction in Classroom Discourse and Learning Outcomes

Keywords: At-risk students, Case studies, Conversation/ Discourse analysis, Mixed-method research, Primary education, Science education, Secondary education, Student learning, Teacher Effectiveness, Teacher professional development, Teaching/instruction, Video analysis

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Ilonca Hardy, Goethe-Universität Frankfurt, Germany

Organiser: Ilonca Hardy, Goethe-Universität Frankfurt, Germany

Organiser: Jasmin Decristan, Germany

Discussant: Janneke van de Pol, Utrecht University, Netherlands

The nature and quality of classroom discourse with regard to teacher prompting and student participation is regarded one of the major opportunities for student development in conceptual understanding, motivation, and self-concept (Wubbels & Brekelmans, 2005). On part of the teachers, productive classroom discourse has been described with concepts such as teacher scaffolding and instructional adaptations (Parsons et al., 2018; Smit, van Eerde, & Bakker, 2013; van de Pol, Volman, Oort, & Beishuizen, 2015). These concepts acknowledge discourse elements such as teachers' active diagnosis of student understanding, their prompting for understanding, and their adaptations to diverse student prerequisites. On part of the students, concepts such as dialogic discourse, argumentation patterns, and student engagement presume that students take on active roles in contributing to classroom discourse (Elizabeth, Anderson, Snow, & Selman, 2012). Yet, particularly students of ethnic minority backgrounds and low linguistic and cognitive prerequisites are less often involved in teacher-student interactions and productive classroom discourse (Black, 2004). In this symposium, we investigate teachers' strategies to foster productive classroom discourse and their relations a) to student individual differences, b) student differential participation patterns, and c) their learning outcomes. We will address these interrelations between teacher discourse and student participation by employing different methodological approaches (low inference ratings of videos and transcripts; comparative case studies) to predict student cognitive and motivational outcomes in elementary and secondary school. This way, we elaborate on current research on productive classroom discourse and its implications for teacher education and professional development.

Participation in classroom discussion: conditions and consequences for students' achievement

Presenting Author: Franziska Locher, Otto-Friedrich-University of Bamberg, Germany; **Presenting Author:** Bianka Troll, Leuphana Universität Lüneburg, Germany; **Co-Author:** Jasmin Decristan, University of Wuppertal; IDEa-Research Center, Germany; **Co-Author:** Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:** Eva Lena Heide, Goethe-Universität Frankfurt, Germany; **Co-Author:** Csaba Kurucz, Freie Universität Berlin, Germany; **Co-Author:** Mareike Kunter, Goethe-Universität Frankfurt, Germany

Students' participation in classroom discourse is considered a vital element of student learning as well as a relevant indicator of social integration (e.g., Black, 2004; Ing et al., 2016). However, research shows that teachers less often interact with at-risk students (e.g., Brophy & Good, 1974; Jurik et al., 2013). But are at-risk students not willing to participate or do teachers not call on these students? Clearly, the connection between student- and teacher-guided participation in classroom discourse, student characteristics, and learning outcomes still needs further research. In the present study, we used video codings of individual student-teacher interactions to investigate student- and teacher-guided participation in 35 elementary science classes with 628 students (N = 936 verbal contributions, and N = 1,740 further hand-raising). Results show that students at-risk of school failure tend to participate less in classroom discourse and that teachers seem to even enhance this by differentially calling on students. In turn, student-guided participation was related to better post-test achievement. These findings can contribute to a better understanding of students' differential learning development. Results also indicate that researchers and teachers should pay particular attention to those students who are not actively involved in classroom discourse.

Effects of contingent support in primary science classroom discourse

Presenting Author: Ilonca Hardy, Goethe-Universität Frankfurt, Germany; **Co-Author:** Susanne Mannel, Goethe University Frankfurt am Main, Germany; **Co-Author:** Nicola Meschede, University of Muenster, Germany

In contingent learning situations the teacher's support is adjusted to the learning needs of the students (e.g. van de Pol et al., 2011). In order to teach contingently, teachers need to use both diagnostic strategies to elicit students' current understanding and intervention strategies which are based on the diagnostic information to offer adequate support (e.g. verbal prompts; Pea, 2004; Reiser, 2004). Up till now, the effectiveness of contingent teaching for students' learning could be shown for tutoring situations (Wischgoll et al., 2015). In order to investigate if teacher contingent support is also a relevant predictor for students' conceptual understanding in whole-class settings, a rating for contingent teaching was developed and applied to a database of N=17 transcribed primary science lessons on the topic of floating and sinking (N=9 double-coded). The rating includes teachers' diagnostic strategies during discourse, their use of diagnostic information for offering verbal support and the resulting student understanding as shown in the classroom discourse. These three indicators for contingency in teaching were used in a second step to build a global index for contingent support. In line with our assumptions, multilevel regression analysis reveals that contingent support in classroom discourse (global index) is a significant predictor for students' posttests measures on floating and sinking, controlling for relevant measures for learning on the individual level. Especially ongoing diagnosis of students' understanding seems to play an important role in fostering learning, as revealed by further analyses. The findings underline the relevance of contingent teacher support for students' learning.

How does changed quality of classroom discussions affect students' participation and motivation?

Presenting Author: Miriam Moser, University of Fribourg, Switzerland; **Co-Author:** Matthias Zimmermann, University of Fribourg, Switzerland; **Co-Author:** Anke Wischgoll, University of Fribourg, Switzerland; **Co-Author:** Kurt Reusser, University of Zurich, Switzerland; **Co-Author:** Christine Pauli, University of Fribourg, Switzerland

This paper examines students' participation behavior in classroom discussions in the subjects of mathematics (two classes/teachers, N= 47 students) and history (two classes/teachers, N=46 students) using case analyses. As part of an intervention study, the teachers participated in a professional development program (duration: one year) which aimed to improve the quality of their classroom discussions in the direction of dialogic discussions. This paper focuses on the question of how the observable participation of the students in classroom discussions changes during the teacher professional development (TPD) and how these changes relate to students' perception of classroom discussions and of their own discussion behavior, as well as motivational aspects of learning (subject-related motivation, self-concept). We address these questions in a process-related manner on the basis of survey data (student questionnaire and interviews) gathered pre- and post-intervention, and through quantitative and qualitative analyses of four video-recorded classroom discussions per teacher (pretest/posttest videos, two videos recorded during the TPD). The analyses of the video-recorded classroom discussions which are available so far reveal a change in learners' participation behavior (regarding proportion of speech and content) and in the quality of classroom discussions over the course of the training (including more dialogic and fewer IRE discussion patterns). The posttest will take place in January 2019; thus, the comparative analyses of student surveys (students' motivation and perception of participation) from pre- and posttest are still pending.

Mono- & multilingual students' participation and teachers' scaffolding in science classroom discourse

Presenting Author: Anika Bürgermeister, University of Leipzig, Germany; **Co-Author:** Jasmin Rashad, University of Leipzig, Germany; **Co-Author:** Henrik Saalbach, University of Leipzig, Germany; **Co-Author:** Kim Lange-Schubert, University of Leipzig, Germany

As there is a growing proportion of a multilingual population in Germany (Otinowska & de Angelis, 2014), teachers as well need to deal with an increasing linguistic and cultural heterogeneity at school and in the classroom. Simultaneously, empirical research shows, that monolingual students outperform multilingual learners in different domains (e.g. Reiss, Sälzer, Schiepe-Tiska, Klieme & Köller, 2015). However, only few studies directly focus on multilingual students' needs for successful learning, their participation in educational discourse and on teachers' specific supporting strategies in the classroom (Auernheimer, 2013). The present study thus aims at simultaneously investigating students' participation in classroom discourse, teachers' scaffolding strategies and effects on different student outcomes, by additionally comparing mono- and multilingual classrooms. The study is a reanalysis of a video study, which investigates science instruction in primary (N= 60) and secondary classes (N= 54). First findings show (N= 17 classes), that in classes with a high proportion of multilingual learners (at least 25%), students tend to participate less in classroom discourse (number of utterances: $M= 292$, $SD= 119.20$) than students in monolingual classes ($M= 505.44$, $SD= 138.54$; Cohens $d= 1.65$). Further multi-level-analyses aim at investigating the interaction between students' participation and teachers' scaffolding strategies on science learning. Possible implications for instructional processes and concrete verbal support in the context of educational discourse in multi- and monolingual classes are discussed.

Session M 3

15 August 2019 08:30 - 10:00

Lecture Hall - H05

Symposium

Task-oriented reading: conditions for learning from texts in educational contexts

Keywords: Computer-assisted learning, Computer-supported collaborative learning, Experimental studies, Higher education, Instructional design, Metacognition, Reading comprehension, Secondary education, Self-regulation

Interest group: SIG 16 - Metacognition, SIG 27 - Online Measures of Learning Processes

Chairperson: Amos van Gelderen, Netherlands

Organiser: Mariska Okkinga, Rotterdam University of Applied Sciences, Netherlands

Organiser: Jolique Kielstra, Radboud University, Netherlands

Discussant: Nadine Spörer, University of Potsdam, Germany

Task-oriented reading is conceptualized as an adaptive problem-solving process in which readers use parts of texts selectively based on their relevance for a specific learning task. In this process, the usage of strategies is important to lead to efficient and accurate task performance. Students, both in secondary education and in higher education, are often confronted with learning tasks requiring to read texts. However, many students experience difficulties in reading to successfully perform these tasks. The four contributions in this symposium investigate how different task conditions influence students' task-oriented reading in different educational contexts. The first study investigates the influence of text-availability and question format on students' navigation of text parts and comprehension. The second study discusses the effectiveness of explicit strategy instruction on students' text learning performance. The third study is intended to design and test a technology-enhanced learning environment aiding students in teacher education in the process of task-oriented reading through structured small group discussions. The last study investigates the influence of text level (micro, meso or macro) on students' task-oriented reading and text comprehension. Together these studies shed light on conditions improving students' approaches to task-oriented reading.

Effects of text availability and question format on readers' processing and learning

Presenting Author: Maria-Angeles Serrano, University of Valencia, Spain; **Co-Author:** Eduardo Vidal-Abarca, Universidad de Valencia, Spain

We conducted three experiments to analyze how text availability (open-book, closed-book) and question format (multiple-choice: MC, open-ended: OE) affect readers' processes and performance when reading texts to answer comprehension questions. Junior high school students (Experiments 1-2) and freshmen (Experiment 3) read expository texts and answered both MC and OE questions on a computer that recorded reading times and readers' actions with the application Read&Answer. Experiment 3 also included a closed-book transfer test. The results from Experiment 1 and 2 showed that readers re-read prior text segments more often in a closed-book test than in an open-book test and that readers made more search decisions in the open-book test when answering OE questions than when answering MC questions. Regarding performance, we found an interaction effect between availability and question format since open-book test benefited the OE, but not MC format. Results from experiment 3 will be available soon. We conclude that text availability affects the initial processing of the text, and question format has an impact on search decisions and affects the readers' scores in open-book tests.

Fostering secondary school students' text-learning strategy use through a strategy-focused program

Presenting Author: Amélie Rogiers, Ghent University, Belgium; **Co-Author:** Emmelien Merchie, Ghent University, Belgium; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

As the knowledge in our information society continues to increase, so do the demands for the efficient and effective use of text-learning strategies. This is especially true in secondary education, where students are progressively expected to independently obtain knowledge from texts. However, research shows that in today's classrooms many students struggle with learning from informative texts. They only apply a limited and less successful strategy repertoire and often do not develop a rich repertoire spontaneously. Therefore, this study examined the effectiveness of explicit strategy instruction to foster seventh-grade secondary school students' performance. A large-scale experiment in an authentic educational setting with a switching replication design (with two groups and three measurement occasions) was set up in which 689 students followed an eight-lesson teacher-delivered instructional treatment. Students and teachers in Group 1 worked with the intervention program in the first period of three weeks, between the first and second measurement occasion, while Group 2 worked with the program in the second period of three weeks, between the second and third measurement occasion. Multilevel piecewise growth analysis was used to examine the evolution in students' recall performance between measurement occasions. The results show that both in Group 1 and 2 students' performance in learning from text improved significantly after receiving the intervention. Moreover, the effect of the intervention was maintained in Group 1 two months after the strategy-focused intervention. The present study demonstrates that a strategy-focused explicit teaching program is a promising approach to improve secondary school students' text-learning performance.

A Technology-Enhanced Learning Environment for Task-Oriented Reading in Groups

Presenting Author: Mariska Okkinga, Rotterdam University of Applied Sciences, Netherlands; **Co-Author:** Amos van Gelderen, University of Amsterdam / Rotterdam University of Applied Sciences, Netherlands

Task-oriented reading is an important aspect of students' curriculum in higher vocational education. In almost all disciplines students are required to use long texts in order to complete tasks aiming at the acquisition of new domain specific knowledge and insight into conceptual relations. However, many students in higher vocational education have little prior experience in this type of reading and lack strategies for executing it efficiently and effectively. This study is intended to design and test a technology-enhanced learning environment (TELE) aiding students in teacher education in the process of task-oriented reading in two stages: homework and group discussion. In this presentation we provide insight in the design and results of the TELE for task-oriented reading in two pilot studies, taking place in higher vocational education with third-year teacher-students. The pilots are a prequel to a final experiment testing the effects of the structuring of group discussions of teacher-students on the quality of their task-oriented reading. Results showed that student appreciated the group discussions about the different group tasks and observations showed that the group tasks elicited discussions about relevant text segments. The TELE might become an excellent tool for structuring group work in a way that stimulates students to take an active role in their learning process and to acquire self-regulatory strategies that guide them to use long study texts effectively and efficiently.

Reading strategies enactment: the influence of task complexity on task-oriented reading

Presenting Author: Jolique Kielstra, Radboud University, Netherlands; **Co-Author:** Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:** Roel van Steensel, Erasmus University Rotterdam, Netherlands; **Co-Author:** Ludo Verhoeven, Radboud University Nijmegen, Netherlands

In school students are continuously asked to read texts and execute tasks related to these texts. Many students experience difficulties in reading to successfully perform these tasks. Task-oriented reading (T-OR) involves reading and processing of information in the text to perform a specific task. Previous studies suggest the importance of reading strategies for successful T-OR. More proficient students tend to use more and more diverse reading strategies compared to less skilled readers, but interactions with task complexities have not yet been investigated. Moreover, little is known about the influence of task complexity on how students execute reading strategies nor on how students regulate T-OR. Therefore this study examined the influence of task complexity on task performance, strategy-execution and pre-and post-task regulation of 44 secondary school students. First, task complexity significantly affected task performance. Students performed less on more complex tasks. Second, task complexity did not affect strategy-execution, which indicated that students do not adapt their reading strategy to task complexity. Third, pre-task regulation indicated that students are able to align strategy selection for elaboration tasks, but less so for text and bridging task. Post-task regulation showed that students were aware of their strategy-execution for text-based tasks but less so for bridging and elaboration tasks. This provides us with detailed insights into how readers regulate their T-OR and how less proficient students could be supported during T-OR.

Session M 4

15 August 2019 08:30 - 10:00

Contextual influences on teacher motivations, self-efficacy, and instructional & wellbeing outcomes

Keywords: Educational Psychology, Motivation, Quantitative methods, Teacher professional development

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Helen Watt, University of Sydney, Australia

Organiser: Helen Watt, University of Sydney, Australia

Discussant: Einar Skaalvik, Norwegian University of Science and Technology, Norway

A burgeoning literature among which the symposium presenters and discussant (from five countries) have been at the forefront, has begun to collectively establish the importance of teachers' motivational beliefs, both for their own professional practice and wellbeing, and students' engagement and learning. Against a political backdrop of concern regarding teacher attrition and burnout in many countries, we focus on the role of school contextual demands and supports in influencing and potentially modifying teachers' motivational beliefs.

Collectively, we empirically investigate the role of individually and collectively experienced school environments, in promoting (or undermining) teachers' optimal motivation and continuing effectiveness and wellbeing: involving teachers from different countries and career stages: entry to teacher education until mid-career; employing sophisticated analytic methods: latent profile analysis, longitudinal structural equation models [SEMs], multilevel models; framed by complementary theoretical perspectives: expectancy-value / self-efficacy / job demands-resources / achievement goal theories.

Findings reveal which motivational beliefs proved most adaptive for instructional and wellbeing outcomes, and, especially highlight the detrimental role of experienced excessive demands and pressure within teachers' school contexts, to promote negative (and reduce positive) outcomes. Our Discussant will elaborate implications for theory, future studies, teacher professional development, teacher education and educational policy.

Motives to choose a teaching career and burnout development during the first 10 years of service

Presenting Author:Burkhard Gniewosz, University of Salzburg, Austria; **Co-Author:**Helen Watt, University of Sydney, Australia; **Co-Author:**Paul Richardson, Monash University, Australia

Based on Expectancy value theory this study investigates how motives to choose a teaching career measured in the first university year, affect burnout development among teachers from early career to 10 years of service. Using data of the FIT-Choice Study (phases 1, 3, and 4; sample: 766 Australian beginning teachers), four latent classes of motive profiles based on future teachers' intrinsic motives, personal and social utility beliefs as well as regarding teaching as a fallback career, could be identified: 1) prioritizing intrinsic values (6.5%); 2) a balanced value profile (20.1%); 3) prioritizing social values (69.1%); and 4) prioritizing personal values & fallback (4.4%). Predicting burnout development using latent true change analyses, classes 2 and 3 reported decreasing burnout over time; class 4, a potential risk group, reported an increase starting on a relatively high level. The results will be discussed in terms of how particular motive profiles for choosing teaching constitute potential protective versus risk factors, for subsequent burnout development during their teaching career.

Influences Among Teachers' Self-Efficacy, Behavior and School Contexts Into Mid-Career

Presenting Author:Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Helen Watt, University of Sydney, Australia; **Co-Author:**Paul Richardson, Monash University, Australia

This longitudinal study investigated the effects of teacher classroom management self-efficacy on teacher-reported classroom behavior (structure and negativity) from the end of university until mid-career. We further examined whether the evolution of teacher-reported self-efficacy and classroom behaviors related to external resources (school advantage, mentoring) and excessive demands. Participants were primary and secondary school teachers ($N = 395$; 56.5% secondary) from the continuing longitudinal FIT-Choice study (Watt & Richardson, 2007) In this study, we analyzed the data from 395 teachers who had all participated in waves 3 (early career) and 4 (mid-career), and the majority also participated in wave 2 (end of university; $N = 294$; 74.4%). Longitudinal structural equation models revealed that high self-efficacy at the end of university predicted high reported structure and low negativity at early career, although self-efficacy in early-career had no effects on reported teaching at mid-career. Our findings further indicated that negative teaching behaviors impeded the development of positive teaching behaviors already early in teachers' careers. The development of positive teaching behaviors was further enabled at lower levels of experienced excessive demands. School advantage in early career positively contributed to teacher-reported classroom management self-efficacy and structure in early career. In mid-career, excessive demands related to negative teaching behaviors, suggesting these teachers were at risk for negative behaviors even though they were already established in their careers.

Influences on Beginning Teachers' Motivations, Reported Instruction and Burnout until Mid-Career

Presenting Author:Helen Watt, University of Sydney, Australia; **Co-Author:**Paul Richardson, Monash University, Australia

We examined stability of teaching motivations, role of experienced excessive demands/leadership support, and reported instruction and burnout among 424 Australian secondary ($n = 242$) and primary ($n = 182$) teachers (338 women; 124 second-career teachers) from the FIT-Choice project (www.fitchoice.org), at early (T1: $M = 3$ years) and mid-career (T2: $M = 10$ years). Surveys measured motivational values and contextual demands and supports (T1/T2); burnout, and self-reported positive and negative teaching (T2). Hypothesised latent moderations of motivational trajectories by demands/supports, and influences on reported instruction and burnout, were tested using SEM. Gender, secondary/primary teaching and second-career teachers were covariates. During early career, secondary teachers experienced greater demands and less supportive leadership; women perceived lower demands (more women were primary). Second-career related only to gender (more men). Demands and personal values significantly increased over time. Motivations were moderately stable until mid-career; demands and leadership less so. During early career, demands associated with reduced intrinsic value, and leadership with higher intrinsic and social values. At mid-career, demands associated with reduced intrinsic and personal values, and leadership with higher social values. Early career leadership support did not buffer subsequent declines for any motivations. Intrinsic value was eroded by excessive demands during early career, with flow-on consequences for reduced positive teaching and higher burnout by mid-career. Social values, primary teaching and female gender also predicted positive teaching. Mid-career excessive demands (positively) and supportive leadership (negatively) related to burnout. Positive teaching reduced negative teaching; burnout promoted it. Results emphasise an imperative to reduce excessive demands experienced by beginning teachers.

For Better and for Worse: School Principal Influences on Teachers' Achievement Goals and Instruction

Presenting Author:Ruth Butler, Hebrew University of Jerusalem, Israel; **Co-Author:**Limor Shibaz, Psycho-Educational Services, Rehovot, Israel

We conceptualize principal performance pressure on teachers to attain high student achievement (PPP) and principal support for teacher development (PSTD) as leadership practices that orient teachers to corresponding ability versus mastery achievement goals for teaching. Here, we extend this approach in two directions. First, we predicted that PPP evokes less adaptive goals both directly and by moderating the effects of PSTD. Second, we predicted that PPP and PSTD influence teachers' mastery versus performance instruction, via teachers' achievement goals. Third, we predicted that PPP moderates the effects of PSTD on performance instruction as well. In Study 1, 650 teachers from 42 schools in Israel reported on perceived PPP and PSTD and their achievement goals for teaching. Multi-level modeling confirmed that PPP predicted individual and school level differences in ability-approach, ability-avoidance and work avoidance goals and moderated the effects of PSTD. PSTD predicted mastery goals, but also predicted ability goals at high levels of PPP and protected against work avoidance only at low levels of PPP. In Study 2, a subsample of 329 teachers reported on their mastery and performance approaches to instruction several months later. PPP predicted performance instruction via teachers' ability-approach goals. PSTD and mastery goals predicted mastery instruction, but also predicted performance instruction at high levels of PPP. Results have implications for theory and research on contextual influences on teacher (and student) motivation, which rarely consider interaction effects. The adverse effects of PPP challenge the motivational assumptions of accountability policy initiatives.

Session M 5

15 August 2019 08:30 - 10:00

Lecture Hall - H11

Symposium

Motivational, Social and Affective Processes

Exploring the Development of Self-Efficacy: An Interactive, International Symposium

Keywords: Achievement, Attitudes and beliefs, Higher education, Literacy, Motivation, Motivation and emotion, Primary education, Science education, Self-efficacy, Writing/Literacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Ellen Usher, University of Kentucky, United States

Discussant: Sharon Zumbrunn, United States

Self-efficacy has long been heralded as a powerful force of change in teacher behavior and student learning (Bandura, 1997). However, our understanding of the principles and trajectories of change of efficacy beliefs not only across specific content domains, but also across the developmental span is limited. Such limitations reduce our ability to foster healthy self-efficacy beliefs in the classroom. This gap has led researchers to call for longitudinal and experimental studies that explore the development of self-efficacy.

Bringing together several scholars from different research teams across the globe, the proposed interactive symposium is designed to engage the audience in a discussion of multiple studies exploring the patterns of change of self-efficacy beliefs. Four teams will present longitudinal/experimental studies of self-efficacy, varying by design, content domain, and developmental span. Following the paper presentations, a discussant with intimate knowledge in this area will synthesize findings and directions across the papers and raise key questions related to issues. The remaining time of the session will be devoted to an interactive panel-audience discussion. During this discussion, audience members will have the opportunity to ask questions and/or share insights related to their own self-efficacy research by populating a Google form (Figure 1). Audience contributions will be projected and used to facilitate a discussion of student and teacher self-efficacy beliefs research. Following the session, audience contributions will be shared with the goal of establishing an international research community dedicated to advancing future scholarship on teacher and student efficacy beliefs.

Self-efficacy of early career teachers: Beyond the first year 'reality shock'

Presenting Author: Sindu George, Monash University, Australia; **Co-Author:** Paul Richardson, Monash University, Australia; **Co-Author:** Helen Watt, University of Sydney, Australia

Teachers' self-efficacy is considered one of the key motivational beliefs influencing their professional behaviours and students' learning. Although Bandura (1997) proposed that self-efficacy once established is relatively stable, it remains a topic of debate as empirical evidence has shown different patterns of changes in self-efficacy across different career stages. The current study presents longitudinal data from 74 beginning school teachers in Victoria, Australia to discern the patterns of change in their early career. Data were collected from teachers while they were in the first year of teaching and again in their sixth year of teaching using Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001). Repeated-measures MANOVA analysed changes in mean scores for the three subscales: classroom management, student engagement, and instructional strategies, and effects of between-subject factors, such as, gender, school sector (government and private), school level (primary and secondary), and form of employment (full-time and not full-time). An increase in self-efficacy was observed supporting the malleability of self-efficacy during early years of career. The identified differences in self-efficacies did not depend on any of the tested between-subject factors.

Gender Differences and Roles of Two Competence Beliefs in Predicting Post-College Outcomes

Presenting Author: Kristy Robinson, Michigan State University, United States; **Co-Author:** Anthony Perez, Old Dominion University, United States; **Co-Author:** Arianna White-Levatch, Old Dominion University, United States; **Co-Author:** Lisa Linnenbrink-Garcia, Michigan State University, United States

This study examined the roles of two competence beliefs, self-efficacy for scientific tasks and perceived academic competence in science, during the final year of college. The end of college is a key transition point when students prepare to transition to the workforce or graduate school, and when competence beliefs that have been shaped throughout college play a particularly important role in students' decision-making processes. Using structural equation modeling, we examined science self-efficacy and perceived academic competence as predictors of post-graduation outcomes (science career intentions and life satisfaction), controlling for prior achievement. Findings indicated that both competence beliefs predicted career intentions, but only perceived academic competence predicted life satisfaction. To better understand the processes that contribute to gender gaps in certain science careers, a multigroup approach was used to examine gender differences in mean levels of competence beliefs and in the structural relations among the variables of interest. Females reported lower competence beliefs, despite having similar levels of prior achievement; the relations of competence beliefs to outcomes also varied by gender. Results extend our theoretical understanding of the roles of two distinct competence beliefs and the potential mechanisms explaining gender gaps in science fields.

Reading Self-Efficacy Development: A Longitudinal Analysis of Self-Efficacy and Its Sources

Presenting Author: Eija Rääkkönen, University of Jyväskylä, Finland; **Presenting Author:** Mikko Aro, University of Jyväskylä, Finland; **Co-Author:** Pilvi Peura, University of Jyväskylä, Finland; **Co-Author:** Tuija Aro, University of Jyväskylä, Finland; **Co-Author:** Ellen Usher, University of Kentucky, United States; **Co-Author:** Helena Viholainen, University of Jyväskylä, Finland; **Co-Author:** Tuire Koponen, University of Jyväskylä, Finland

The beliefs children hold about their capabilities as readers are known to influence their reading achievement. However, less is known how these efficacy beliefs develop and change. The aim of this study was to extend previous work by examining heterogeneous trajectories of change in reading self-efficacy among primary school students (N = 1327) across 11 months and by examining the relations between those trajectories and sources of reading self-efficacy. Using growth mixture modeling, we identified four different trajectories of change in reading self-efficacy. The levels of sources of reading self-efficacy predicted students' trajectories of change in self-efficacy, the higher, i.e. more positive, levels of sources relating to positively developing trajectories. Decreasing patterns in sources of self-efficacy, i.e. less positive experiences, related to low declining trajectory in self-efficacy. Findings point to the importance of ensuring that students have opportunities to experience early reading mastery, of providing them with positive feedback and focusing on reducing negative affect in reading situations. From a theoretical point of view, our findings confirm the theoretical tenets proposed by Bandura (1997) of the role of the sources of self-efficacy in self-efficacy development.

Stimulating students' self-efficacy for writing: Lessons from a two-iteration intervention study

Presenting Author: Fien De Smedt, Ghent University, Belgium; **Co-Author:** Steve Graham, Arizona State University, United States; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

We investigated the impact of explicit writing instruction and peer-assisted writing on elementary students' self-efficacy for writing during a two-iteration intervention study. In the first iteration 11 teachers and their 206 fifth and sixth-grade students participated in a 2 (i.e.; explicit instruction versus writing opportunities without explicit instruction) x 2 (i.e.; peer-assisted writing versus writing individually) experimental intervention study with a pretest-posttest design. The four experimental conditions were compared with a business as usual (BAU) condition. In the larger-scale follow-up iteration, participating classes (N=431 fifth and sixth graders, N=20 teachers) were randomly assigned to either one of the two experimental conditions (i.e., EI+PA students received explicit instruction and practiced writing with a peer, while EI+IND practiced writing individually) or the BAU condition. A randomized control design with two measurement occasions was used and multilevel analyses were performed. In the first iteration, no statistical effects of explicit instruction nor peer-assisted writing were found for students' self-efficacy for writing. In the second iteration, results revealed that EI+PA students were more self-efficacious to invent ideas compared to their EI+IND counterparts. Based on these findings, theoretical and educational implications will be discussed in view of stimulating students' self-efficacy during everyday classroom writing and methodological issues regarding the measurement of self-efficacy will be raised.

Session M 6

State-of-the-art process measures of student and teacher emotions in the classroom setting

Keywords: Achievement, Assessment methods and tools, Collaborative Learning, Emotion and affect, Higher education, Mathematics, Mixed-method research, Motivation and emotion, Problem solving, Quantitative methods, Secondary education, Social aspects of learning and teaching, Teaching/instruction, Video analysis

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Monika Donker, Utrecht University, Netherlands

Discussant: Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany

In the last decades we have witnessed a large increase in studies on emotions in the classroom setting. The importance of these academic emotions for both student and teacher outcomes has been repeatedly demonstrated (Frenzel, Goetz, Stephens, & Jacob, 2009; Pekrun, Goetz, Titz, & Perry, 2002). The development of questionnaires, such as the Achievement Emotions Questionnaire (AEQ; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011), have further advanced this field of research. However, recently there has been a call to move beyond self-reported, inter-individual, and short-term assessment of emotions by implementing intensive process measures (Fisher, Medaglia, & Jeronimus, 2018; Murayama et al., 2017). These process measures should give insight not only in the emotional outcome, but also in the process leading up to these outcomes. Recent technological advancements have enabled researchers to study emotional processes not only in the laboratory, but also in real-life contexts (Wilhelm & Grossman, 2010). The presenters in this symposium will discuss four of these state-of-the-art measures of students' and teachers' real-life emotional processes: 1) experience sampling, 2) eye-tracking, 3) facial coding, and 4) physiology. The studies cover both student and teacher emotions, secondary education and university contexts, and also applied questionnaires assessing self-reported emotions to link the current results to previous research findings. Our discussant, an eminent emotion researcher, will engage the authors and audience in an interactive discussion of promises and challenges, the value for both research and practice, and future directions in the use of intensive process measures.

Control antecedents and achievement effects of test anxiety components: An intra-individual approach

Presenting Author:Anna-Lena Roos, University of Konstanz, Germany; **Co-Author:**Thomas Goetz, University of Konstanz, Germany; **Co-Author:**Maike Krannich, University of Zurich, Switzerland

As test anxiety is a prevalent emotion in school, knowledge about its antecedents and effects is crucial. Pekrun's control-value theory (CVT) refers to control as a central antecedent and performance as a major effect of anxiety. However, although anxiety constitutes of multiple components (i.e., cognitive, affective, motivational, and physiological components) and some findings suggest that there might be differences regarding their antecedents and effects, previous research largely neglected to examine them separately. Therefore, this study investigated the individual anxiety components in the framework of the CVT in a sample of $N = 137$ German 8th graders and had the goal to identify which component should be primarily addressed in order to increase students' performance. As the CVT describes intra-individual processes, we aimed at complementing findings from traditional inter-individual studies by applying an intra-individual real-time approach. Results showed that lower control was associated with higher anxiety (i.e. all of the anxiety components) and that the anxiety components indeed differ with regard to their relative impact on performance in such a way that the cognitive component seems to be central for performance. Therefore, our findings suggest that the CVT also holds true on an intra-individual level and that it is important to distinguish between the anxiety components and focus anxiety interventions on the cognitive component in order to increase students' performance. Implications for future research are outlined regarding the use of multiple-component measures and intra-individual approaches when examining anxiety.

What do anxious students look at during real-world mathematics problem-solving?

Presenting Author:Nora McIntyre, University of York, United Kingdom; **Co-Author:**Enrique Garcia Moreno-Esteva, University of Helsinki, Finland; **Co-Author:**Eeva Haataja, University of Helsinki, Finland; **Co-Author:**Miika Toivanen, University of Helsinki, Finland; **Co-Author:**Markku Hannula, University of Helsinki, Finland

Collaborative problem-solving plays a major role in adulthood and the mathematics classroom offers an opportunity for children to develop this skill. Here, it is possible to explore potentially positive and negative experiences during collaborative problem-solving as well as the behavioural indicators of such experiences. Since eye-tracking provides an involuntary, implicit, and therefore internally valid measure of gaze behaviour, the gaze of seven 16-year-old Finnish students was recorded during 50 minute problem-solving session in a real-world mathematics lesson. Student gaze was analysed in relation to four dimensions of self-reported mathematics experience: liking, self-efficacy, anxiety and importance attributed to mathematics. Gaze at collaborators' bodies and problem-solving tools were found to increase with student anxiety. With increasing anxiety, students appear to be monitoring their collaborators more closely. Moreover, problem-solving tools may exacerbate negative experiences among students with high levels of anxiety.

Teachers' and Learners' Emotional Experiences in Class: Using Automated Facial Action Coding

Presenting Author:Anton Marx, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Anne Christiane Frenzel, University of Munich, Germany; **Co-Author:**Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Corinna Reck, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Mitho Müller, Ludwig-Maximilians-Universität (LMU), Germany

While previous studies on the prevalence of teacher and student emotions relied almost exclusively on subjective self-report data, our newly developed methodological approach combines self-report measures with automated coding of emotional expressions to analyze teachers' and learners' emotional experiences in real-life learning situations. This study aimed to test our methodological approach in the field and to examine the relations of self-reported emotions and automatically coded facial expressions in real teaching and learning situations. We videotaped academic lecturers and their students with multiple synchronized cameras and analyzed their facial expressions of positive and negative affect on a frame-by-frame basis. We further assessed self-report measures of emotions immediately after the videotaped sessions. Our results support the applicability of our newly developed methodological approach. The correlations between self-reported and observed emotions were all positive, but small in size (average $r = .13$), with one exception: Positive emotion indicators for teachers correlated substantially ($r = .53$).

Teachers' Physiological Arousal during Teacher-Student Interaction as Predictor of Teacher Emotions

Presenting Author:Monika Donker, Utrecht University, Netherlands; **Co-Author:**Tim Mainhard, Utrecht University, Netherlands; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Teacher-student interaction has often been claimed as a central aspect in the emergence of both positive and negative teacher emotions. However, information is lacking about the processes during teaching leading to differences in teachers' emotions. To get grip on these behavioral and emotional processes, we explored continuous measures of teachers' physiological reactions and teachers' interpersonal behavior (i.e., Agency/dominance and Communion/friendliness) during real-life classroom teaching in a sample of 80 teachers. Due to the intensive longitudinal nature of the data, we were able to analyze not only inter-individual mean level correlations, but also intra-individual associations between physiology and behavior over time. We discovered that not only mean levels of Agency and Communion were very important for teachers' emotional functioning, but also that the intra-individual association with heart rate gave us extra information about possible challenges for teachers. More specifically, teachers that had an increased heart rate when showing friendly behavior (i.e., high Communion) reported higher levels of negative emotional outcomes. Using physiological and behavioral process measures in the context of teacher emotions might help to design personalized interventions for teachers and might provide them with the fine-grained information needed to cope with the everyday challenges of teacher-student interaction.

Session M 7

The effect of educational games on cognitive and non-cognitive predictors of early math abilities.

Keywords: At-risk students, Cognitive skills, Developmental processes, Emotion and affect, Experimental studies, Game-based learning, Mathematics, Numeracy, Technology

Interest group:

Chairperson: Delphine Sasanguie, KU LEUVEN, Belgium

Organiser: Fien Depaepe, KU LEUVEN, Belgium

Discussant: Judith ter Vrugte, University of Twente, Netherlands

The use of digital educational games has been shown to be beneficial for early math abilities. Therefore, more studies – like the ones presented in this symposium - started to focus on how these games affect the underlying building blocks of math abilities and which specific characteristics of these games are so effective and consequently responsible for the transfer to a child's broader math abilities. Two talks will focus on the effect of training cognitive predictors on broader math abilities and the related non-cognitive factor math anxiety. Morsanyi et al. (Talk 1) investigated how games can be used to accelerate the developmental process of numerical ordering skills when children enter formal schooling. Similarly, Vanbecelaere et al. (Talk 2) trained first graders with two other cognitive predictors, i.e. number line estimation and comparison, but additionally contrasted an adaptive vs a non-adaptive game version. In talks 2 and 3, the effects of training with an adaptive game will be further unraveled. Jansen (Talk 3) demonstrated how a new statistical technique, i.e. the fast-slow model, applied to children's large-scale training data with the adaptive Math Garden game can be used to dissociate between two cognitive building blocks of math abilities, namely subitizing and counting. Finally, combining magnetoencephalographic measurements (MEG), with behavioral data, Schwenk et al. (Talk 4), revealed that dyscalculic children's responses to an adaptive game can be predicted by neural data. This way, adopting a multiperspective approach, this symposium will contribute to our knowledge about the effectiveness of training with numerical educational games.

The early development and training of ordering skills, and their relationship with maths abilities.

Presenting Author:Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Kinga Morsanyi, Queen's University Belfast, United Kingdom; **Co-Author:**Jort Peters, KU LEUVEN, Belgium; **Co-Author:**Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Patrick O'Connor, Queen's University, Belfast, Belgium; **Co-Author:**Delphine Sasanguie, KU Leuven, Belgium

There is increasing evidence that ordering skills (the ability to order both numerical and non-numerical items) are important predictors of mathematics performance, in the case of both children and adults. Nevertheless, there are still many unanswered questions. For example, very little is known about how and when children develop various ordering skills, to what extent ordering skills can be trained in the case of young children, and whether the effect of such training would generalize to mathematics skills. This talk presents two studies that aimed to address these questions. The results of the first study suggest that during the first school year, ordering skills are rapidly developing, which could make them ideal targets for interventions. The second study (which is still ongoing), focuses on training children in ordering skills, with the main purpose of establishing whether such training could lead to improvements in mathematics skills. The theoretical and practical implications of the findings will also be discussed.

The effect of an adaptive game on cognitive and non-cognitive factors in young children.

Presenting Author:Stefanie Vanbecelaere, KU Leuven, Belgium; **Co-Author:**Katrien Van den Berghe, KU Leuven KULAK, Belgium; **Co-Author:**Frederik Cornillie, KU Leuven KULAK, Belgium; **Co-Author:**Delphine Sasanguie, KU Leuven, Belgium; **Co-Author:**Bert Reynvoet, KU Leuven, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium

Educational games are frequently used to train early numerical abilities (i.e. digit comparison, number line estimation), as these abilities are important predictors for children's future general math abilities. It has been demonstrated that these games could positively influence cognitive factors. Moreover, there is an increasing interest in *adaptive* educational games because they constantly assess children's performance, and accordingly adapt the difficulty of the tasks. However, studies investigating the effectiveness of educational games often do not investigate transfer of the trained skills. In addition, evidence with regard to the effectivity of adaptive games is to date limited. Therefore, we conducted two studies. In a first longitudinal, quasi-experiment with 336 first graders we examined the cognitive and non-cognitive outcomes of playing the non-adaptive version of Number Sense Game (NSG) for a period of six weeks. Before and after the intervention, we examined the effect on similar tasks (i.e. digit comparison and number line estimation or the so-called near transfer) and on more general math abilities (far transfer). In a second study, 84 first graders were randomly enrolled in two experimental conditions (i.e. playing the adaptive vs a non-adaptive NSG) to investigate not only children's learning gains but also the time needed to achieve those learning gains. The first study has shown that digital educational games have similar effects as conventional teaching methods on both near and far transfer tasks, except for number line estimation. Results of the second study revealed that adaptive games lead to shorter learning periods.

The predictive value of enumeration abilities for mathematical performance.

Presenting Author:Brenda Jansen, University of Amsterdam, Netherlands

The development of mathematical abilities is conditional on the ability to enumerate. For enumeration, various strategies are possible. Whereas subitizing (fast, correct responses) can be applied to sets with 1-4 elements, counting (with speed depending on the size of the set; more subject to errors) is applied to sets with larger numbers. Although the distinction between subitizing and counting is accepted by most researchers, procedures to distinguish between those two are not without problems. Here, we apply a new statistical technique, the fast-slow model, to a data set from Math Garden, a computer-adaptive large-scale online math practice program, in order to dissociate between subitizing and counting. Children frequently play in Math Garden, during a full school year and often during several school years. Hence, Math Garden delivers a huge amount of longitudinal data. The fast-slow model assigns children's responses to either a fast or a slow processes. Hierarchical regression analyses on the parameters of the fast and slow process indicate that the processes indeed match the subitizing and counting process, respectively. Finally, enumeration ability will be correlated with mathematics performance (e.g., addition and subtraction abilities) at a later age. We will study the relation between early enumeration ability and later mathematics performance in several time frames.

Understanding dyscalculic children's response to computer-based training.

Presenting Author:Christin Schwenk, TU Dortmund University, Germany; **Co-Author:**Jörg-Tobias Kuhn, Technical University Dortmund, Germany; **Co-Author:**Vera Dehmelt, University of Muenster, Germany; **Co-Author:**Julia Raddatz, University of Muenster, Germany; **Co-Author:**Heinz Holling, University of Muenster, Germany; **Co-Author:**Christian Dobel, Friedrich-Schiller University, Jena, Germany

Symbolic magnitude processing is an early core marker of mathematical ability which serves to identify children at-risk for dyscalculia. In the present study, dyscalculic elementary school students ($PR \leq 10$; $N=34$, $M_{age}=9.07$, grades 2 to 4) worked on single- and double-digit comparison tasks while magnetoencephalographic (MEG) measurements were conducted. Based on the numerical distance effect (NDE), these MEG data were analyzed to pinpoint neural correlates of symbolic magnitude processing across the sample, revealing a complex network of frontal, temporal, and parietal regions. In a next step, a subsample ($n=17$, $M_{age}=8.94$) received a thirty-day computer-based dyscalculia training. The training, which is embedded in a playful environment, fosters different aspects of number (line) and magnitude processing as well as quick calculation. It is adaptive in terms of task difficulty. Children's response to training was measured by several basic numerical and arithmetic outcomes. Combining the results of individual neural correlates of digit processing captured before training and post-training achievement, we investigated the predictive power of neural markers for response to computer-based training. Stepwise regression analyses revealed that pre-training NDE on mainly frontal and temporal regions could incrementally predict post-training mathematical achievement. Overall, a

weaker pre-training neural NDE went along with better post-training performance. Taken together, our findings suggest that (symbolic) magnitude processing depends on multiple functional brain areas instead of a narrow number module. Moreover, they show that response to a computer-based intervention can be predicted by neural data. In this respect, the study adds to the growing field of neuro-educational research.

Session M 8

15 August 2019 08:30 - 10:00

Lecture Hall - H10

Symposium

Cognitive Science

Neurocognitive origins of learning disorders

Keywords: Cognitive development, Cognitive skills, Learning and developmental difficulties, Learning approaches, Learning disabilities, Neuroscience

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Michael Artur Skeide, Germany

Organiser: Michael Artur Skeide, Germany

Discussant: Bert De Smedt, KU LEUVEN, Belgium

A substantial proportion of the population suffers from learning disorders that cannot be explained by inadequate instruction, but instead originate from atypical brain development. The overarching objective of our symposium is to discuss the latest empirical advances in understanding the early neurocognitive foundations of these disorders. Our presentations are centered on written and spoken language (dyslexia and language disorders) and on math (dyscalculia), also taking into account their often overlooked co-occurrence. Accordingly, we provide the unique opportunity to draw a comprehensive picture of the three most common learning disorders and their dynamic interplay. At the same time, the presenters will allow ample room for controversy by highlighting different perspectives, for example, on the question whether learning disorders originate from altered or just from delayed brain development. On this basis, our discussant will raise critical questions about the unity and diversity of learning disorders and stimulate lively debate about how the reported insights from basic science could help to design targeted early educational intervention programs. The symposium is thus of immediate interest for scientists, practitioners, and policymakers alike.

The neurobiological predisposition for developing dyslexia

Presenting Author:Ulrike Kuhl, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Indra Kraft, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Gesa Schaadt, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Liane Dörr, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Jens Brauer, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Nicole Neef, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Ivonne Czepezaue, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Bent Müller, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Arndt Wilcke, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Holger Kirsten, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Frank Emmrich, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Johannes Boltze, Fraunhofer Institute for Cell Therapy and Immunology, Germany; **Co-Author:**Angela Friederici, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Michael Artur Skeide, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

There is a remarkable variety of sensory and cognitive theories of the neurobiological origins of developmental dyslexia. Yet, as dyslexic individuals tend to avoid reading and writing, it is unknown whether existing accounts reflect its neurobiological predispositions or effects of reduced literacy experience. Relying on a longitudinal case-control design, we overcame this limitation by following children from a preliterate to school age using comprehensive psychometric assessment and magnetic resonance imaging. Remarkably, dyslexia reveals itself already at the preliterate age in terms of malformations and altered connectivity within a brain network supporting speech sound processing. Moreover, combining these neural indices with behavioural measures of speech processing skills, we are able to accurately predict whether an individual would develop dyslexia or not. Our work provides the empirical foundation for dyslexia screening and intervention programs that take effect early and target speech sound processing specifically.

Traces of dyslexia in the auditory cortex

Presenting Author:Michael Artur Skeide, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Pierre-Louis Bazin, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Robert Trampel, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Andreas Schäfer, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Claudia Männel, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Katharina von Kriegstein, Max Planck Institute for Human Cognitive and Brain Sciences, Germany; **Co-Author:**Angela Friederici, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Auditory language processing deficits are a core characteristic of dyslexia. In line with this, there is ex-vivo evidence for misplaced nerve cells in the auditory cortex of affected individuals. Here we explored whether this malformation can be detected in vivo with magnetic resonance imaging. Compared to control participants, dyslexic individuals indeed revealed significantly increased white matter thickness and white matter concentration in the left auditory cortex. Consequently, responses to language might be less finetuned and therefore hamper building stable links between language and letter strings. Recent findings in preliterate children that later develop dyslexia are consistent with this interpretation. Accordingly, children at risk for dyslexia might profit from early language intervention helping them to compensate for their neurobiological burden before school.

Growing up with dyscalculia – how does the numerical brain develop?

Presenting Author:Ursina McCaskey, University Children's Hospital, Switzerland; **Co-Author:**Michael von Aster, Clinic for Child and Adolescent Psychiatry, German Red Cross Hospitals, Berlin, Germany; **Co-Author:**Ruth Tuura O'Gorman, Children's Hospital Zurich, Switzerland; **Co-Author:**Karin Kucian, University Children's Hospital, Switzerland

Developmental dyscalculia is a learning disability affecting the acquisition of basic numerical-arithmetical skills. Studies reveal deficits in number processing, aberrant functional activation of the numerical network and differences in the brain structure of dyscalculic subjects. However, knowledge about the neural development of numerical abilities is scarce. We therefore investigated the functional and structural brain development of children with and without developmental dyscalculia twice over the time course of 4 years. Our results confirmed that the behavioral deficits and the reduced grey and white matter volumes persist over development. However, the functional study revealed an increase in activation in the entire fronto-parietal numerical network in dyscalculic children compared to a control group. This suggests a continuation in the functional neural development of number representation in developmental dyscalculia. Therefore, an early diagnosis and immediate onset of support would be beneficial for children with developmental dyscalculia. Furthermore, the understanding of the development of the typical and atypical numerical abilities might be meaningful for education and support of children with difficulties in mathematics.

Cognitive correlates of early reading and early arithmetic in 5-year olds

Presenting Author:Kiran Vanbinst, KU Leuven, Belgium; **Co-Author:**Elsje van Bergen, VU Amsterdam, Netherlands; **Co-Author:**Pol Ghesquiere, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium

Learning difficulties characterized by deficits in reading (dyslexia) or arithmetic (dyscalculia) co-occur frequently. This study aimed to investigate overlap between early reading and early arithmetic before the start of formal education. Further, we aimed to explore whether key underlying cognitive skills of one learning ability also correlate with the other. Regression analyses and Bayesian hypothesis testing revealed strong connections between early reading and early arithmetic in 188 five-year-old kindergartners who had not yet received formal education. Phonological awareness predicted early reading and, critically, early arithmetic (even when early reading and arithmetic-specific cognitive correlates were controlled for). Numeral recognition predicted early arithmetic, but also early reading (even when early arithmetic and phonological awareness were controlled for). We aim to draw the attention on the importance of investigating

reading and arithmetic together, as we that found these learning abilities are already connected from an early stage of development on. Both learning abilities also share under-lying cognitive processes, i.e., phonological awareness and numeral recognition.

Session M 9

15 August 2019 08:30 - 10:00

Seminar Room - S14

Single Paper

Cognitive Science, Developmental Aspects of Instruction, Learning and Special Education

Attitudes and Beliefs in Primary Education

Keywords: At-risk students, Attitudes and beliefs, Culture, Motivation, Numeracy, Peer interaction, Primary education, Qualitative methods, Self-efficacy

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs

Chairperson: Lindie van der Westhuizen, University of Luxembourg, Luxembourg

Personal epistemologies of elementary school students around the world

Keywords: Attitudes and beliefs, Culture, Primary education, Qualitative methods

Presenting Author: Florian Feucht, www.ThinkingHabitats.com, United States; **Co-Author:** Regina Rotshtein, University of Toledo, United States; **Co-Author:** Kristen Porter, Mercy College, United States; **Co-Author:** Andres Acher, Martin Luther University Halle-Wittenberg, Germany; **Co-Author:** Valerie Frède, Université Toulouse - Jean Jaurès, France; **Co-Author:** Yue Gu, University of Toledo, United States; **Co-Author:** Andrea Mohme, School System Luebeck, Germany; **Co-Author:** Elizabeth Curtis, Queensland University of Technology, Australia; **Co-Author:** Jo Lunn Brownlee, Queensland University of Technology, Australia

Personal epistemology, beliefs about knowledge, is an important component for promoting deeper learning and higher-level critical thinking. We examined the personal epistemologies of 240 fourth-grade and sixth-grade students in six different countries, on six continents around the world. Students were asked to identify an objectify or entity in their environment that represents knowledge to them, and to provide a rationale for why the entity represents knowledge. A number of rationales referenced beliefs about learning, intelligence, truth, and knowledge change, which correspond with several dimensions in existing frameworks that conceptualize personal epistemology. Other themes that emerged from the data included aesthetics, knowledge containers, and sustainability, which have not been previously described in relation to personal epistemology, but which were more commonly described by students in Africa. Other differences across countries, such as variations in prevalence of the learning and intelligence themes, were common, suggesting that the way children perceive the links between knowledge, learning, and intelligence may be influenced by cultural factors. Personal epistemology has been identified as an important predictor of fruitful and deep student learning; hence, it is of high relevance to consider it as a factor when thinking about tomorrow's education.

Attitudes to Mathematics in Young English and Chinese Children

Keywords: Attitudes and beliefs, Culture, Numeracy, Primary education

Presenting Author: Ann Dowker, University of Oxford, United Kingdom; **Co-Author:** Olivia Cheriton, Magdalen College, Oxford University, United Kingdom; **Co-Author:** Rachel Horton, St Anne's College, Oxford University, United Kingdom; **Co-Author:** Winifred Mark, Hong Kong University, Hong Kong

Most studies of children's attitudes to mathematics have dealt with children in second grade or later, and have suggested that attitudes deteriorate, and in particular anxiety increases with age. The present study investigated attitudes to mathematics in 67 English and 49 Chinese children at the end of their first year of school. The participants were given Thomas and Dowker's (2000) Mathematics Attitude Questionnaire, which uses pictorial rating scales to assess primary school children's mathematics anxiety, liking for mathematics, unhappiness at poor performance in mathematics, and self-rating in mathematics. They were also given the British Abilities Scales Basic Number Skills test. Attitudes were generally positive. The Chinese children performed better in the arithmetic test and also rated themselves higher than the English children, but did not differ in other attitudes. Self-rating in mathematics and lack of unhappiness at poor performance were associated with better performance in the English group. There were no significant relationships between attitudes and performance in the Chinese group. Implications of the findings are discussed.

First grade reader self-concept – interactions with initial self-concept and reading intervention

Keywords: At-risk students, Attitudes and beliefs, Motivation, Primary education

Presenting Author: Bente Walgermo, University of Stavanger, Norway; **Co-Author:** Jan Frijters, Child and youth studies, Canada; **Co-Author:** Oddny Judith Solheim, The Norwegian Reading Centre, Norway

Already within the first year of formal reading instruction students with poor early reading skills tend to have a weaker reader self-concept and to make more use of task-avoidance strategies than their peers. The aim of the present study was to investigate whether participation in an intensive first-grade reading intervention was associated with changes in student's reader self-concept. The total sample consisted of 1,141 students (mean age 6.15), of whom 212 were identified as being at risk of RD at school entry. The results show that emergent readers considered to be at risk of RD had a significantly weaker reader self-concept than their not-at-risk peers already at school entry with a substantial effect size ($d = .38$). Further, no main effect of intervention was observed on reader self-concept measures at the end of Grade 1. However, a complex interaction was observed among Grade 1 entry levels of self-concept, intervention or control status, and end-of-Grade 1 reader self-concept. A quantile regression estimated the effect of intervention on end-of-Grade 1 self-concept at varying levels of initial self-concept. At low levels of initial self-concept, the effect of intervention was positive ($\beta = .185$).

Prerequisites of Primary School Students' Pro-social Behavior in the Inclusive Classroom

Keywords: Attitudes and beliefs, Peer interaction, Primary education, Self-efficacy

Presenting Author: Marwin Felix Löper, Paderborn University, Germany; **Co-Author:** Frank Hellmich, Paderborn University, Germany

Primary school students' pro-social behavior is regarded as an important prerequisite for the social participation of children with special educational needs in inclusive classrooms. Especially, children with social or emotional disabilities are less accepted than children with other disabilities. Therefore, research is needed in order to better understand primary school students' pro-social behavior towards peers with special educational needs. In our study, we examine the importance of children's perceived teacher behavior, their contact experiences with peers with social or emotional disabilities, their self-efficacy beliefs concerning their interpersonal skills as well as their attitudes towards peers with social or emotional disabilities for their pro-social behavior in the inclusive classroom. Thus, we examined $N=577$ third and fourth grade primary school students' pro-social behavior in the inclusive classroom depending on their perceived teacher behavior, their contact experiences with peers with social or emotional disabilities, their attitudes towards peers with social or emotional disabilities as well as their self-efficacy beliefs concerning their interpersonal skills. The results of our study indicate that students' pro-social behavior is predicted by their self-efficacy beliefs concerning their interpersonal skills and their perceived teacher behavior towards peers with social or emotional disabilities. In detail, the effect of children's perceived teacher behavior on their pro-social behavior is mediated by their self-efficacy beliefs. However, children's pro-social behavior is neither explained by their contact experiences with peers with SEN nor by their attitudes towards peers with social or emotional disabilities.

Session M 10

15 August 2019 08:30 - 10:00

Seminar Room - S04

Single Paper

Motivational, Social and Affective Processes

Motivation and Emotion

Keywords: Attitudes and beliefs, Educational Psychology, Goal orientation, Motivation, Motivation and emotion, Quantitative methods, Self-efficacy, Survey Research, Workplace learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Ian A.G. Wilkinson, University of Auckland, New Zealand

Self-Efficacy for Instructional Leadership: Relation with Engagement and Emotional Exhaustion

Keywords: Educational Psychology, Motivation, Self-efficacy, Survey Research

Presenting Author: Cecilie Skaalvik, Norwegian University of Science and Technology, Norway

The current study explored relations between principal self-efficacy for instructional leadership, emotional exhaustion, engagement, and motivation to quit the work as a principal. Participants in the study were 340 principals in elementary school and high school in five randomly selected counties in Norway. The theoretical frameworks for the study were self-efficacy theory and theoretical perspectives on instructional leadership. A new 15-item "Self-efficacy for instructional leadership scale" consisting of five subscales was developed and tested by means of confirmatory factor analyses. Both a model defining five correlated primary factors (Model 1) and a model defining a single second order factor (Model 2) had good fit to the data. SEM analysis revealed that self-efficacy for instructional leadership was negatively related to emotional exhaustion and positively related to engagement, indicating good criterion validity of the scale. Self-efficacy was also negatively related to motivation to quit. This relation was indirect and mediated through both emotional exhaustion and engagement. The dimension of self-efficacy for instructional leadership that was most strongly associated with emotional exhaustion and engagement was self-efficacy for motivating teachers. The dimension that was most weakly related to these variables was self-efficacy for creating a positive and safe learning environment for the students.

Need Satisfaction and Achievement Goals of University Faculty for Teaching: A Multinational Study

Keywords: Educational Psychology, Goal orientation, Motivation, Workplace learning

Presenting Author: Martin Daumiller, University of Augsburg, Germany; **Co-Author:** Raven Rinas, Augsburg University, Germany; **Co-Author:** Markus Dresel, University of Augsburg, Germany

Previous research has successfully used achievement goals to describe the motivations of university faculty for teaching and investigated the relevance of achievement goals for student learning and instructors' experiences. While providing strong evidence for the suitability and explanatory power of this approach, previous research has mainly investigated faculty from Germany but not from other cultures with possibly differently functioning motivations. Also, we still know only very little about factors that influence goal preferences of university instructors. Therefore we conducted an international study with 1,675 university instructors from German, US-American, and Chinese teaching and research universities. Participants answered questions concerning their achievement goals, teaching quality, positive affect, and attitudes towards help-seeking as well as their satisfaction of the basic needs for autonomy, relatedness, and competence. Results attested measurement invariance of the scales for language, culture, and university type. Our findings documented similar associations as previous studies between goals and teaching quality, positive affect, and attitudes towards help-seeking and found these associations to be robust for the different cultures. There were small mean level differences in the goals depending on culture, university type, tenure, and gender of the participants. Need satisfaction explained a substantial part of achievement goal preferences, and—directly and indirectly through the goals—also the outcome variables. Altogether, achievement goals explained $\frac{1}{5}$ – $\frac{1}{3}$ of the variance in the outcome variables, and need satisfaction accounted for around 10%. Taken together, these results provide cross-cultural evidence for the relevance of achievement goals for faculty teaching and illuminate relevant mechanisms of goal-setting processes in university faculty.

Processes of Students' Effort Exertion, Competence Beliefs and Motivation

Keywords: Educational Psychology, Motivation, Motivation and emotion, Quantitative methods

Presenting Author: Lars-Erik Malmberg, University of Oxford, United Kingdom; **Co-Author:** Andrew Martin, University of New South Wales, Australia

We pose a process perspective of learning experiences of effort exertion, competence beliefs, and motivation (autonomous and controlled motivation). Going beyond previous intraindividual studies, we investigated iterative (autoregressive) and dynamic (cross-lagged) effects of lagged within-day and within-school-subject variables. In total, 231 students responded to the Learning Experience Questionnaire an average of 15.1 time-points during a week (SD = 3.3; Range = 10 to 26, in total 3,490 time-points). Multilevel structural equation models (MSEM) showed that effort exertion was situational. We found within-school-subject stability of competence belief and autonomous motivation, and both within-day and within-school-subject stability of controlled motivation. Prior within-day controlled motivation predicted subsequent effort exertion and autonomous motivation, reflecting a protective role of teacher expectations. Prior within-school-subject controlled motivation predicted lower subsequent competence and autonomous motivation, reflecting the thwarting role of teacher expectations. Taken together, the present study sheds further light on how learning experiences take place in real-time within school-days and within school-subjects over the course of a school week, and a more precise understanding of the dynamics of student-teacher interactions during this microcosm of time.

Do expectancies and intrinsic value predict each other across learning situations?

Keywords: Attitudes and beliefs, Educational Psychology, Motivation, Motivation and emotion

Presenting Author: Julia Dietrich, Friedrich Schiller University of Jena, Germany; **Co-Author:** Jaana Viljaranta, University of Eastern Finland, Finland; **Co-Author:** Asko Tolvanen, University of Jyväskylä, Finland; **Co-Author:** Julia Moeller, Universität Leipzig, Chad; **Co-Author:** Baerbel Kracke, University of Jena, Germany

This study investigated whether university students' expectancies for success and intrinsic value show cross-lagged associations from one learning situation to another within one lecture, or from one lecture to another during a lecture series across one semester. A sample of 155 undergraduate university students participated the study by reporting their expectancies and intrinsic values three times within one lecture, across ten lectures, in total. Results of multilevel modelling revealed that even though both expectancies and intrinsic value fluctuate within lectures (that is, from one learning situation to another) as well as across lectures (that is, from one lecture to another), no cross-lagged effects between these variables were found: expectancies did not predict later intrinsic value, and, similarly, intrinsic values did not predict later expectancies. However, expectancies and intrinsic value at concurrent time points were relatively highly correlated with each other. These findings suggest that even though different learning situations and lectures seem to influence students' expectancies and intrinsic value so that they vary from one time point to another, this fluctuation goes "hand-in-hand". Therefore, even though expectancy-value theory (Eccles, 1983; Eccles & Wigfield, 2002) suggests that expectancies provide a basis for values so that individuals are more likely to value activities in which they believe themselves to have good capabilities and expect success, this kind of predictive association may not be evident in short-term measurements of expectancies and values.

Session M 11

15 August 2019 08:30 - 10:00

Seminar Room - S06

Single Paper

Cognitive Science

Mathematics and Conceptual Change

Keywords: Cognitive development, Conceptual change, Mathematics, Misconceptions, Numeracy, Primary education

Interest group: SIG 03 - Conceptual Change

Chairperson: Bram De Wever, Ghent University, Belgium

The role of intuition and inhibition in fraction magnitude comparison

Keywords: Cognitive development, Conceptual change, Mathematics, Numeracy

Presenting Author:Jo Van Hoof, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Wim De Neys, Université Paris Descartes, Paris, France; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium

Although a good rational number understanding is very important, many learners struggle to understand fractions (e.g., Siegler et al., 2012). Recent research literature ascribes many of these difficulties to the natural number bias, which is the tendency to apply natural number features in rational number tasks (e.g. Vamvakoussi et al., 2012). Correlational studies found evidence for the intuitive nature of the natural number bias in learners' higher reaction times for correctly solved incongruent items compared to congruent items. However, the fundamental limitation of these studies is that the reported correlations do not ascertain the causality that is assumed in this ascription. In the present study we therefore experimentally elicited intuitive reasoning in a fraction comparison task in educated adults using dual process methodologies, namely the use of time limitation. Results show that the natural number bias has an intuitive character, pointing to the important difference in mathematics education between errors resulting from misconceptions and errors resulting from intuitive thought processes.

Response time patterns when comparing fractions and when comparing divisions

Keywords: Cognitive development, Conceptual change, Mathematics, Numeracy

Presenting Author:David Maximiliano Gomez Rojas, Universidad de O'Higgins, Chile; **Co-Author:**Pablo Dartnell, University of Chile, Chile

Recent investigations on the cognitive foundations of competence with fractions have measured response times in a fraction magnitude comparison task to unveil relevant underlying processes. Several works have shown that participants take longer to compare pairs of fractions with a common numerator than pairs with a common denominator. This finding has been interpreted as the expression of a bias towards considering as larger the fraction composed by larger natural numbers. It has been observed that this effect resembles a Stroop effect, suggesting that it stems from the congruency or incongruency between the magnitudes of the intervening fractions and the magnitudes of their components. Such account implies that the congruency effect should not be specific to the comparison of fractions, but rather to any situation in which component magnitude and whole magnitude conflict. We put this hypothesis to the test by presenting a group of young adults (N=48) with a timed task in which they compared the quotients of two divisions of natural numbers. As in previous works with fractions, we included items in which the divisions shared the same dividend (e.g. 20:4 vs. 20:10) or the same divisor (e.g. 36:6 vs. 48:6). Results showed, against our predictions, that items with the same divisor took longer to answer correctly than items with the same dividend. This outcome suggests that magnitude congruency judgements do not generalize to comparison tasks beyond fractions, and that this general explanation may be inadequate to account for the response time differences observed in fraction comparison.

Natural number bias when comparing fraction magnitudes: strategy use and problem features

Keywords: Cognitive development, Conceptual change, Mathematics, Numeracy

Presenting Author:Andreas Obersteiner, University of Education Freiburg, Germany; **Co-Author:**Martha Alibali, University of Wisconsin-Madison, United States; **Co-Author:**Vijay Marupudi, UNIVERSITY OF WISCONSIN-MADISON, United States

When people compare fraction magnitudes, they sometimes focus on the fractions' natural number components, rather than on the fraction magnitudes. Such reasoning may result in a "natural number bias" (e.g., to think that $1/4 > 1/3$ because $4 > 3$). However, recent studies report mixed results about the bias in items which are more complex, e.g. where the components are larger, and/or both fractions do not share common components (e.g., $19/24$ vs. $25/36$). We investigated whether encouraging people to use benchmarks (reference numbers, e.g., $1/2$ or $1/4$) helps them activate fraction magnitudes and overcome a potential bias. We also investigated the strategies people used for comparing fraction magnitudes. Seventy-two adults solved 28 fraction comparison problems which did or did not afford the use of benchmarks. Participants also reported strategies on a trial-by-trial basis. Overall, we found a reverse "smaller components—larger fraction" bias. Strategy use varied by problem type, suggesting that participants used strategies adaptively. Providing a tip about benchmarks reduced the bias but did not increase overall performance. The study highlights variability in strategy use, and suggests that this variability may account for diverse bias patterns in previous studies.

How robust are learners' misconceptions of fractions? An intervention study using refutation text.

Keywords: Conceptual change, Mathematics, Misconceptions, Primary education

Presenting Author:Jo Van Hoof, KU Leuven, Belgium; **Co-Author:**Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Wim Van Dooren, KU Leuven, Belgium

Although a good understanding of the rational number domain is an essential part of mathematical literacy, many learners have misconceptions of fractions. For instance, they tend to think that a fraction's numerical value decreases when its denominator or numerator decreases (e.g., $2/7$ is smaller than $2/9$, just like 7 is smaller than 9). The present intervention study aimed to investigate how robust natural number based misconceptions are, after learners have specifically been instructed on the incorrectness of their strategy by means of a refutation text. Results show that while a general increase was found in learners' accuracy on a fraction comparison test, they also point to large individual differences in the learning gains from refutation text.

Session M 12

15 August 2019 08:30 - 10:00

Seminar Room - S13

Single Paper

Learning and Instructional Technology, Learning and Social Interaction

Computer-assisted Learning and Mathematics

Keywords: Achievement, Collaborative Learning, Computer-assisted learning, Design based research, Educational technology, Learning Technologies, Mathematics, Motivation and emotion, Secondary education, Teaching/instruction, Video analysis

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 18 - Educational Effectiveness, SIG 27 - Online Measures of Learning Processes

Chairperson: Tarja-Riitta Hurme, University of Turku, Finland

Teacher's gestures scaffold learning in collaborative problem solving but are students looking?

Keywords: Collaborative Learning, Mathematics, Teaching/instruction, Video analysis

Presenting Author:Annina Koskinen-Salmia, University of Helsinki, Finland; **Co-Author:**Eeva Haataja, University of Helsinki, Finland; **Co-Author:**Miika Toivanen, University of Helsinki, Finland; **Co-Author:**Markku Hannula, University of Helsinki, Finland

While multiple studies have provided evidence of gestures' beneficial role for learning in various contexts, research on students' visual attention on teachers' gestures is lacking. In this paper we address this topic by tracking teacher's gestures and student's visual attention on them through the stages of collaborative mathematical problem solving class. Qualitative analysis of classroom activities is combined with gaze-tracking data from one teacher and four target group students. The first stage of our analysis revealed that teacher used mostly pointing gestures to guide student attention both in whole-class instruction and group-scaffolding while representational gestures were used to highlight the dynamical nature of mathematical context. Students were able to follow teacher's pointing gestures, whereas during representational gestures students' visual attention was more scattered and some gestural clues were missed by students. Closer analysis of group-scaffolding events combined with heatmapping technique that illustrates the gaze targets of teacher and students, illuminates how teacher's gestures construct joint attention, crucial to collaborative problem solving. We conclude that in naturalistic classroom environments, students' ability to follow and glean information from teacher's gestures depends on situational factors as well as the level of joint attention.

Impact of a digital device on mathematics achievement in primary school: a randomized trial.

Keywords: Achievement, Computer-assisted learning, Mathematics, Motivation and emotion

Presenting Author:Manon Laurent, Université Grenoble Alpes, France; **Co-Author:**Pascal Bressoux, Université Grenoble Alpes, France; **Co-Author:**Pierre Tchounikine, Université Grenoble Alpes, France

This study evaluates a digital device coupling programming using the Scratch software and explicit verbalization in order to develop pupils' mathematical skills at Grades 4 and 5. Mathematics learning in France is a concerning issue. Pupils show recurring difficulties in this area, yet predictive of academic success. Differences between low performing and higher performing pupils are increasing. French pupils suffer from math anxiety, which impedes the learning process. We use the approach of computational thinking to improve learning in mathematics. Digital can enhance understanding; in particular, programming would enable the development of abstraction abilities. We hypothesize that this device will improve mathematics acquisitions and reduce pupils' anxiety toward mathematics. In this study, teachers (N = 109) and their elementary school pupils (N = 2576) were divided according to two conditions: "digital" (n = 1520) and "paper" (n = 953). Pupils' achievement and math anxiety were assessed through standardized tests before and after the experiment. Additional achievement tests were assessed before and after sequences. Both groups addressed the same mathematical concepts; whereas the experimental group had a programming approach followed by explicit verbalization in order to translate the program into mathematical writing. Our first analyzes show that there is no difference in the evolution of pupils' achievement with or without digital approach. There was, however, a significant decrease with low magnitude of anxiety in the digital condition. Further analyzes will be conducted to determine whether this effect is moderated by individual characteristics.

The Powerbar – Effects of a resource-restricting tool while solving spatial tasks on mobile devices

Keywords: Computer-assisted learning, Learning Technologies, Mathematics, Motivation and emotion

Presenting Author:Michael Montag, Bauhaus-University of Weimar, Germany; **Co-Author:**Sven Bertel, Flensburg University of Applied Sciences, Germany; **Co-Author:**Björn B. DeKoning, Erasmus University Rotterdam, Netherlands, Netherlands; **Co-Author:**Steffi Zander, University of Applied Sciences Magdeburg-Stendal, Germany

Based on former studies, which showed the beneficial use of touch-gestures while solving rotation tasks on tablets via rotating the presented object, we integrated an interaction-restricting tool into the original app. The so-called Powerbar was developed to foster mental processes while solving spatial tasks. When activating the Powerbar, the amount of rotating the stimuli is limited relatively to the initial angular disparity. The Powerbar therefore was expected to lead children to use a combination of mental and physical (touch-based dynamic interaction) processes while solving the tasks. The general aim of the current study is to investigate the influence of limiting touch-based rotation by using the Powerbar compared to unlimited rotation while solving physical rotation tasks. Effects on success rate, effort, rotation behavior and motivation are investigated.

Working with a Mathematics Teacher to Teach with Technology: A case in Turkey

Keywords: Design based research, Educational technology, Mathematics, Secondary education

Presenting Author:Ipek Saralar, University of Nottingham, United Kingdom; **Co-Author:**Shaaron Ainsworth, University of Nottingham, United Kingdom; **Co-Author:**Geoff Wake, University of Nottingham, United Kingdom

The problem of teaching 3D shapes has received considerable attention in the last decade and integrating technology into the teaching of 3D shapes has been suggested by many curriculum developers. However, given the plethora of existing tools available for use, teachers can struggle to know and choose them and use these effectively in their classroom. In our previous research, mathematics teachers were observed teaching 3D shapes, interviewed about their teaching choices, and they discussed their challenges in teaching 3D shapes with technology. As a result, a 6-lesson course was designed and then tested with an initial sample of students by the researcher and pre to post scores showed it was successful. The next stage of this design-based research project, which reported in this paper, was to work with a teacher who had not previously been involved as she adapted and adopted the lesson plans for her own classrooms. Interviews, lessons observations and children's test scores were utilised to examine the challenges and the opportunities for the teacher in this approach, how the lessons were enacted by the teacher and how students were helped to learn about 3D shapes using approaches neither they nor the teacher had encountered previously.

Session M 13

15 August 2019 08:30 - 10:00

Seminar Room - S09

Single Paper

Teaching and Teacher Education

Teaching Approaches and Instruction

Keywords: Biology, Environmental education, Higher education, Mixed-method research, Pre-service teacher education, Primary education, Reading comprehension, Science education, Secondary education, Self-regulation, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Tamal Kumar De, KU LEUVEN, Belgium

Fostering learning strategies to support self-regulated learning: A Multilevel Analysis

Keywords: Reading comprehension, Self-regulation, Teaching approaches, Teaching/instruction

Presenting Author:Andrea Vogt, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Self-regulated learning is essential for academic success. Learning strategies can help to support and improve self-regulated learning. To examine the efficacy of a teacher based learning strategy training we tested 5th grade students (N=4232) who were divided into two groups. Specially trained teachers supported the students of the experimental group in using learning strategies. One year after the baseline measurement a second measurement of learning outcome, conditional knowledge about learning strategies and self-rated learning strategy use took place. A substantial amount of variance in learning outcome, conditional knowledge of learning strategies and self-rating of learning strategy use in the context of reading was due to differences between school classes and students. We found a significant interaction between time of measurement and treatment. Students in the treatment group showed an increase in their self-rating of learning strategy use while the control group showed a decrease from the first to the second measurement. Measuring the learning strategies by looking at behavioral variables is advisable for future studies to gain deeper insights in the actual learning strategy use.

Mentoring relationship in internships of teacher education

Keywords: Higher education, Mixed-method research, Pre-service teacher education, Teaching/instruction

Presenting Author:Miriam Gruening, Otto-Friedrich-Universität Bamberg, Germany; **Presenting Author:**Anja Winkler, University of Bern, Switzerland

The relationship between students and internship teachers is an important quality feature of internships in teacher education. A precondition for any form of learning guidance and for a high-quality internship seems to be a relationship based on mutual trust, respect and goodwill. Leading on from a parallel mixed-method approach, expectations of these relationships were examined qualitatively via rating conferences (N=35) and quantitatively via a questionnaire (N=77) at two institutions in Switzerland. The results show high expectations of the students on the relationship, which are only fulfilled to a limited extent during the internship. Internship teachers who can respond benevolently to the students are more likely to live up to the expectations. The perception of the different aspects of the relationship also show a rather high correlation with the expectations.

Embodiment as a Teaching Practice in High School Level Physics

Keywords: Science education, Secondary education, Teaching approaches, Teaching/instruction

Presenting Author:Yael Kashtan, Levinsky College of Education, Israel; **Co-Author:**Einat Gil, Levinsky College of Education, Israel; **Co-Author:**Roni Mualem, Levinsky College of Education, Israel

Embodiment in education has been the subject of extensive research in the past two decades. In those studies, embodiment was found to reflect students reasoning and allow teachers and researchers to gather information about student's formation of ideas. Gestures may express aspects of meaning that are not

expressed in speech. Considering the contribution of embodiment to learning, the current study investigates the way teachers use embodiment in teaching, as a resource for teaching practices. Our focus is on physics teaching, building upon previous classification of embodiment. The purpose of this study is to present different types of embodiment that takes place in physics lessons and discuss their role in learning and teaching. Gestures and body movement were identified from video documentation and from interviews of two master physics teachers and their students, at high school physics level classes. The videos were transcribed and analyzed, identifying learning events occurring during the lessons. Findings include teaching practices: Using whole body simulation that clarifies basic concepts about electric current; Gestures, intentionally made by the teacher demonstrating forces and trajectories; And occasional gestures made by students, revealing their thinking and enabling the teacher to address their ideas. This study might inspire the use of embodiment in the teaching of physics and suggests ways to do it.

Storytelling in taking over a perspective in order to support an identity for the environment

Keywords: Biology, Environmental education, Mixed-method research, Primary education

Presenting Author: Florian Rietz, University of Teacher Education St.Gallen, Switzerland; **Co-Author:** Arvid Nagel, University of Teacher Education St.Gallen, Switzerland; **Co-Author:** Nicolas Robin, Fachdidaktik Naturwissenschaften, Switzerland

After more than one decade of education initiatives for sustainable development (Unced, 1992), the formation of the children's awareness for our environment is still highly relevant (Stevenson et al., 2013). Therefore, it is of central relevance to analyse and deconstruct the complex ideas presented in this section with the intention of a better understanding for the problems, which appear within the education of children regarding a sustainable development in our environment. Our focus turns towards the development of primary school children's identification with the environment. It is very important to form an appropriate framework to be able to analyse and reflect the problems of environment which children are confronted with in a way appropriate to their age. In the framework of this quantitative partial study, the results of these OLS-regressions show that certain aspects in attitude towards nature show important predictors for the explanation of primary school children's relationship with nature (adj. $R^2_{pre} = .24$; adj. $R^2_{post} = .26$), ($\beta_{pre} = .15-.30, p < .05$ [four items]; $\beta_{post} = .15-.30, p < .05$ [five items]) if we measure at two different points of time, we can identify different nature based attitudes as predictors of medial effect for the children's relationship with nature.

Session M 14

15 August 2019 08:30 - 10:00

Seminar Room - S15

Single Paper

Culture, Morality, Religion and Education, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Teaching Approaches

Keywords: Attitudes and beliefs, Citizenship education, Conversation/ Discourse analysis, Early childhood education, Lifelong learning, Pre-service teacher education, Quantitative methods, Reading comprehension, Student learning, Teacher professional development, Teaching approaches, Values education, Video analysis

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education

Chairperson: Vera Busse, Germany

Exploring the effects of teaching reading strategies on student L2 reading skills; a one year study

Keywords: Lifelong learning, Reading comprehension, Student learning, Teaching approaches

Presenting Author: Deborah Yapp, University of Utrecht, Netherlands; **Co-Author:** Rick de Graaff, IVLOS, Universiteit Utrecht, Netherlands; **Co-Author:** Huub van den Bergh, University Utrecht, Netherlands

For Dutch college students, the ability to comprehend complex English text, competently and efficiently, is essential. There is concern whether Dutch students in higher education are assimilating their L2 reading effectively enough for their studies. Furthermore, students entering polytechnic education from vocational levels, approximately one third of all polytechnic students, experience difficulty reading and digesting L2 academic texts. A focused L2 reading strategy course of seven weeks, was developed based on design principles from our meta-analysis, and forms the foundation of our one year empirical study. This L2 reading course combined reading strategies with training in metacognition and awareness raising in student's self-efficacy as long term successful L2 readers. Students were taught strategies and self-monitoring methods for two hours a week with the aim of improving their L2 reading comprehension. A variety of pedagogical approaches were used to support struggling student's reading skills, hitherto unsupported at this institution. Teachers kept logbooks of teaching approaches, met weekly to discuss study implementation, were observed teaching and observed each other, with collegial exchanges of best practices being encouraged and stimulated. Data was collected from 933 first year students using a regression discontinuity design with participants functioning as their own control. Data was analyzed using multilevel analysis. Results underscore the benefits of L2 reading strategy instruction: Students showed a significant mean improvement between pretest and posttest. While all students improved in reading comprehension, rate of improvement was not uniform for all teachers, highlighting the need for more investigation in pedagogical differences and effects.

Guided play in early years education: From observation to educational intervention

Keywords: Early childhood education, Teacher professional development, Teaching approaches, Video analysis

Presenting Author: Valeska Grau, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Amaya Lorca de Urarte, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Macarena Perez, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Daniela Jadue, Universidad de O'higgins, Chile; **Co-Author:** Katherine Strasser, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** David Preiss, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Magdalena Muller, Pontificia Universidad Católica de Chile, Chile

Play is universal within human behavior and yet we are not clear about its functionality in relation to learning, development and well-being. Despite the growing interest that playfulness has attracted in recent years, we still lack consistent evidence regarding the advantages of play-based approaches and the way in which they should be implemented to promote children's development in educational contexts. Also, there is a need to develop validated programs of teacher education in relation to implementation and mediation of guided play. This paper presents 2 consequent studies addressing these issues: the first study explores playful activities carried out in 58 pre-school classrooms from different socio-economical background in Chile. Using the Weisberg et al (2015) framework, guided play activities were identified and coded according to children's autonomy, type of play and type of teacher mediation. The second study consisted in a pilot of a teacher professional development programme aimed to improve mediation of guided play in pre-school. The effects of were measured through observation protocols, pre-post classroom videotaping and interviews. Results show how scarce play in general -and specifically guided play- appears at all socio-economical levels, and the higher frequency of mediation regarding provision of materials and behavioral control more than co-playing, observing or facilitating the play. Also, the pilot programme showed that through a short period training using videos of their own practice, educators show an improvement in play observation skills and the range of mediation practices used during guided play.

Teaching democratic values through classroom discussions on controversial issues

Keywords: Citizenship education, Conversation/ Discourse analysis, Teaching approaches, Values education

Presenting Author: Jaap Schuitema, University of Amsterdam, Netherlands; **Co-Author:** Kim Jurgens, University of Amsterdam, Netherlands; **Co-Author:** Patricia Kruit, Amsterdam University of Applied Sciences, Netherlands; **Co-Author:** Dubravka Knezic, University of Applied Sciences Amsterdam, Netherlands; **Co-Author:** Hessel Nieuwelink, Amsterdam University of Applied Sciences (AUAS), Netherlands

During a classroom discussion on controversial social issues students can learn to reflect on democratic values. However, guiding a classroom discussion on controversial issues is a very complex and demanding task for teachers and there is a lack of research on how teachers can facilitate discussions on these topics. In this study we investigated how teachers guided classroom discussions, which position they took in the discussion on democratic values and how they

perceived their own role in the discussion. We video-recorded eleven classroom discussions on a controversial issue in Urban Dutch schools and interviews eight teachers. The classroom discussions were coded to identify different features of classroom discussion and different teacher roles. The results showed substantial differences between classroom discussions in what we defined as essential features. There were also substantial differences in the way teacher guided the classroom discussion. While some teachers predominately facilitated the process of interaction without interfering with the content of the discussion, others explicitly stimulated specific democratic values. Teachers used different strategies to discuss democratic values and to deal with what they perceived as unacceptable remarks of students. The interviews showed that teachers believed that a safe environment was the most important condition for classroom discussions. Teachers did not indicate to experience large tensions between different teacher roles. This study underlines the importance for teachers to be aware of the different roles teachers can take during a classroom discussion.

Teacher education for inclusion: didactic concepts and their impact on student teachers' beliefs

Keywords: Attitudes and beliefs, Pre-service teacher education, Quantitative methods, Teaching approaches

Presenting Author:Saskia Opalinski, University of Potsdam, Germany; **Co-Author:**Katja Scharenberg, University of Education Freiburg, Germany

Teachers' beliefs about inclusion, as one element of teachers' professional competence, are seen as a key factor in inclusive school development (EADSNE, 2012) and can influence teachers' actions and affect students' outcomes. Numerous previous findings on these beliefs are broadly inconclusive or even contradictory, stem mainly from cross-sectional studies and thus do not allow any statements on development or change of these beliefs. However, there is empirical evidence that university courses on inclusive education can lead to more positive beliefs about inclusion (e.g. Lancaster & Bain, 2007; Sharma & Sokal, 2015). This paper considers the question if pre-service teachers' beliefs about inclusion can be fostered by different types of university courses. We applied a pre-post-design with two conditions with students ($n=106$) attending either a seminar or a seminar with included practical experiences. Data were collected at the beginning and end of the semester in different university courses on inclusive education. Pre-service teachers' beliefs about inclusion were assessed by the subscale 'orientation towards inclusion (IO)' (12 items) of the 'Beliefs inventory for teachers in the context of school support (BILF)' (Moser et al., 2014). Results indicate differences at the end of the semester between the two groups: A significant change in beliefs was only shown for pre-service teachers attending seminars with included practical field trips, but not for those attending seminars without included practical experiences. Based on the results, implications for teacher training in the context of inclusion will be discussed, especially questions regarding the design of university courses.

Session M 15

15 August 2019 08:30 - 10:00

Seminar Room - S03

Single Paper

Assessment and Evaluation, Educational Policy and Systems, Instructional Design

Meta-analysis and Assessment, Methods and Tools

Keywords: Achievement, Assessment methods and tools, Educational policy, Instructional design, Meta-analysis, Peer interaction, Primary education, Problem solving, Quantitative methods, Teacher professional development

Interest group: SIG 01 - Assessment and Evaluation, SIG 06 - Instructional Design

Chairperson: Annabel Watson, University of Exeter, United Kingdom

Do we overestimate teachers' judgment achievement? A critical systematic overview and re-analysis

Keywords: Assessment methods and tools, Meta-analysis, Quantitative methods, Teacher professional development

Presenting Author:Esther Kaufmann, University of Education Zurich / University of Zurich, Switzerland

Teachers often have to judge their students' achievement, but how accurate are their judgments? A number of reviews on teachers' judgment achievement have attempted to answer this question. To date, however, their results have not been systematically compared, nor have they been checked using more up-to-date techniques. After systematically and critically describing previous reviews, we use modern meta-analytical techniques to re-analyse all of the studies on teachers' judgment achievement included in previous reviews. Our results suggest that earlier reviews might have overestimated teachers' judgment achievement, and that estimates of teachers' judgment achievement vary widely across studies. Future studies should investigate whether the heterogeneity is based on artefacts (e.g., measurement error) and/or moderator variables. More studies using the Social Judgment Theory framework would be helpful for identifying whether teacher- or task-related factors are related to judgment (in)accuracy.

Does Peer Assessment Improve Academic performance? A Meta-analysis of Experimental Studies

Keywords: Achievement, Assessment methods and tools, Meta-analysis, Peer interaction

Presenting Author:Therese N. Hopfenbeck, University of Oxford, United Kingdom; **Co-Author:**Kit Double, University of Oxford, United Kingdom; **Co-Author:**Joshua McGrane, University of Oxford, United Kingdom

Formative assessment has received considerable research and policy interest over the last three decades. As a result, numerous educational researchers have advocated the integration of formative assessment practices such as peer assessment into schools and instructional practice. Despite this advocacy, research synthesis in this area has largely relied on narrative reviews to evaluate the efficacy of peer assessment. Here we present a meta-analysis (55 studies, $k = 137$) of (quasi) experimental studies that evaluated the effect of peer assessment on academic performance. The results suggest that peer assessment improves academic performance compared with no assessment ($g = 0.54, p < .001$), but was not significantly different in its effect from either teacher assessment ($g = 0.20, p = .059$) or self-assessment ($g = 0.22, p = .238$). Additionally, a meta-regression examined the moderating effects of several feedback and educational characteristics, which showed that the effectiveness of peer assessment was remarkably robust across a wide range of contexts. These findings provide strong support for peer assessment as a formative assessment practice and suggest several implications for the implementation of formative assessment in instructional practice.

Scaffolding to Develop Diagnostic Competences in Medical and Teacher Education: A Meta-analysis

Keywords: Instructional design, Meta-analysis, Problem solving, Teacher professional development

Presenting Author:Olga Chernikova, Ludwig Maximilian University, Germany; **Co-Author:**Nicole Heitzmann, University Munich & Clinics of University Munich, Germany; **Co-Author:**Maximilian Christian Fink, Institute for Medical Education, Klinikum der Universität München, Germany; **Co-Author:**Venance Timothy, Ludwig-Maximilians-Universität (LMU), Tanzania, United Republic of; **Co-Author:**Tina Seidel, Technische Universität München, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Facilitating diagnostic competences is an important objective of higher education for many professions, especially in the domains of medical and teacher education. This meta-analysis of 35 empirical studies builds on a conceptual framework and investigates the role of problem-solving and scaffolding to foster diagnostic competences in learners with lower and higher levels of prior professional knowledge. Based on moderator analyses we investigate (1) which type of scaffolding is effective at different levels of learners' prior knowledge and (2) the differences of the effects across domains of medical and teacher education. Instructional support has a moderate positive effect ($g = .39; CI [.22; .56]; p = .001$). In contrast to findings of cognitive load research, diagnostic competences are facilitated effectively through problem-solving independent of learners' prior knowledge. Scaffolding types affording more self-regulation are more effective for advanced learners. In contrast, scaffolding offering high levels of guidance is more effective for less advanced learners. The effects of scaffolding are generalizable across the domains of medical and teacher education.

Effect of school entry age on student academic outcomes: Evidences from Austria and Switzerland

Keywords: Achievement, Educational policy, Primary education, Quantitative methods

Presenting Author:Giang Pham, Pädagogische Hochschule St.Gallen, Switzerland; **Co-Author:**Andrea B. Erzinger, University of Berne, Switzerland; **Co-Author:**Daniel Paasch, Federal Institute for Educational Research, Innovation and Development of the Austrian School System (BIFIE), Austria

This paper investigates the effect of school entry age on student academic outcomes using large-scale data in Austria and Switzerland. Based on developmental psychological theories, we hypothesize that students might benefit from entering school at an older age due to maturity effects. Contradictory findings have been found in different countries, even within one study if using different statistical methods. To address this issue, we applied multiple statistical methods to estimate the interested effect including OLS regression, potential outcome approach, and the two-stage least square approach with theoretical age of school entry based on birth month as instrumental variable. For Austria, data of the Austrian Educational Standards Assessment (BIST-Ü) in mathematics in 2012 and 2013 (full survey of 4th and 8th graders) were used. For Switzerland, PISA 2015 data (representative sample of 15-years old students) were analysed. Until the end of the 4th grade, positive effect of older school entry age on student academic outcomes was partially confirmed. But a long-term effect until the 8th grade or the age of 15 was not indicated by the results. However, based on the available large-scale data, the school entry age effect is hardly to distinguish from the selection effect: it is possible that students with lower ability and maturity more frequently enter school at an older age. With regard to the increasing interest of policy makers in the effect of the school entry age on student outcomes, suggestions for future studies have to be discussed.

Session M 16

15 August 2019 08:30 - 10:00

Seminar Room - S01

Single Paper

Educational Policy and Systems

Current Challenges in Education Policy for ECEC for 0 to 3-year-olds

Keywords: Attitudes and beliefs, Early childhood education, Economics of education, Educational policy, Interdisciplinary, Parental involvement in learning, Survey Research

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Francesca Suter, University of Zurich, Switzerland

Early childhood education and care in Portugal: policies and families' reasons for attendance

Keywords: Attitudes and beliefs, Early childhood education, Interdisciplinary, Parental involvement in learning

Presenting Author: Tiago Ferreira, University of Porto, Portugal; **Co-Author:** Manuela Pessanha, Politécnico do Porto, Portugal; **Co-Author:** Joana Cadima, University of Porto, Portugal; **Co-Author:** Sílvia de Barros, Politécnico do Porto, Portugal; **Co-Author:** Carla Peixoto, Polytechnic Institute of Porto, Portugal; **Co-Author:** Vera Coelho, Porto University, FPCE, Portugal; **Co-Author:** Ana Isabel Mota e Costa Pinto, University of Porto - Portugal, Portugal; **Co-Author:** Donna Bryant, Frank Porter Graham Child Development Institute, United States

In this study, we (a) discuss several aspects related to the structure, organization, and staff qualifications of the Portuguese Early Childhood Education and Care (ECEC) system for children under 3, (b) describe parents' main reasons for placing babies in the daycare center during their first year of life and, specifically, reasons for choosing the center they attend, and (c) examine associations between the reasons for choosing the childcare center, and family and ECEC variables. Data for this presentation are part of a broader research project that investigated the infant transition to childcare centers. A total of 90 families with babies ranging from 3 to 9 months of age and attending childcare centers in the Greater Porto Metropolitan Area, Portugal, and their 90 ECEC teachers participated in this study. Data included home and childcare observations (HOME; Caldwell & Bradley, 1984; ITERS-R; Harms, Cryer, & Clifford, 2006/2012), and childcare and family questionnaires. More frequent reasons to opt by center-care were convenience/practical reasons, and quality and prior knowledge were the most frequent motives to choose a specific center. We highlight a positive association between reporting quality and development as the main reason for placing the baby in that center and higher-quality space/materials, but not higher-quality teacher-child interactions. Results will be discussed in light of the main characteristics of the ECEC system in Portugal, such as the criteria to have a place in ECEC, structure and organization aspects of care, staff qualifications. We will also discuss implications for ECEC policies.

Who are the non-users of institutional childcare in Germany?

Keywords: Attitudes and beliefs, Early childhood education, Interdisciplinary, Parental involvement in learning

Presenting Author: Kerstin Lippert, German Youth Institute, Germany; **Co-Author:** Christian Alt, German Youth Institute, Germany; **Co-Author:** Susanne Kuger, German Youth Institute (DJI), Germany

The contribution analyses parents of children under the age of three who do not use institutional childcare in Germany. The provision of early childcare for all children has been one of the major societal and political targets in Germany over the past years. However, after five years of massive expansion of institutional childcare for children under the age of three, the figures on the provision of and demand for childcare still indicate a significant shortfall in provision (Kindertagesbetreuung Kompakt 2018). Against this background, we examine the 67 percent of all parents that do not use institutional childcare for their very young child. That is either because of this shortfall in provision, or because they do not want to use it. We consider the first group of these non-users to be , as they would use institutional childcare under certain circumstances and the latter to be , as they prefer to organise childcare privately. We use decision trees and random forests to estimate the probability of being a > of institutional childcare. Our investigation is based on information on parents of 13,480 children under the age of three from a large panel survey on parental and institutional childcare in Germany from 2018 (DJI-Kinderbetreuungsstudie U12) conducted by the German Youth Institute.

Implementation evaluation of the Finnish national core curriculum for ECEC

Keywords: Early childhood education, Educational policy, Interdisciplinary, Survey Research

Presenting Author: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

The deployment and implementation of the curricula are key quality components of early childhood education and care (ECEC). In Finland, the new national core curriculum for ECEC is the first binding document steering the implementation and development of ECEC. The aim of the evaluation was to investigate the implementation of the national core curriculum. An electronic survey was sent to all municipal providers (n = 299), private service providers of ECEC (n = 501) and private family day care providers (n = 1542). The evaluation produces information on the functionality of the curriculum system in ECEC, the production processes of local curricula, and the contents of the curricula and plans. Content analysis was used to examine local curricula and children's ECEC plans. The results showed that the curriculum system in Finland is mostly functional and the local implementation process went well. However, the local process was hindered by an excessively strict schedule as well as insufficient resources in terms of finances and the allocation of time. Document analysis showed that the transition from the national core curriculum into tangible, local curricula to help guide the operations had not yet been comprehensively fulfilled. The process was also less successful in rural and semi-urban municipalities. Private family day care providers felt that the core duty of family day care is to provide basic, homelike care instead of pedagogically inclined early education. The results add our knowledge on the functionality of the curriculum system and the production processes in different types of services.

Child care fees in Germany

Keywords: Early childhood education, Economics of education, Educational policy, Interdisciplinary

Presenting Author: Susanne Kuger, German Youth Institute (DJI), Germany; **Co-Author:** Franz Neuberger, German Youth Institute, Germany; **Co-Author:** Christian Alt, German Youth Institute, Germany

This paper discusses the distribution of early child care fees paid by parents in Germany. Therefore, we use the latest data from the KiBS Study from the German Youth Institute to show how care fees are distributed among the population. Aim of our analysis is a) to describe the financial burden on parents who choose to place their child age 0 to 3 in childcare and b) identify an income-threshold that could be used to apply a selective fee acquittal. As appropriate indicator for social inequality, we use the share of a household's net income that is spent on childcare fees. Furthermore, we discuss the usefulness of an increase of fees for higher income percentiles, speculate on the size of a reasonable burden for the average family and analyze who might benefit from a

reduction or abolition of care fees. Doing so, we provide new insights for the discussion on early childhood care fees based on actual data.

Session M 17

15 August 2019 08:30 - 10:00

Seminar Room - S02

Single Paper

Instructional Design, Lifelong Learning

Early Childhood Education

Keywords: Achievement, Action research, Attitudes and beliefs, Early childhood education, Learning disabilities, Lifelong learning, Literacy, Mathematics, Mixed-method research, Science education, Self-regulation, Teaching approaches, Teaching/instruction

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 16 - Metacognition

Chairperson: Courtney Pollack, United States

Initial differences in reading acquisition process according to socioeconomic status

Keywords: Early childhood education, Learning disabilities, Literacy, Teaching/instruction

Presenting Author: Victoria Espinoza, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Catalina Santa Cruz, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Ricardo Rosas, Psychology, Chile

Access to written language is fundamental to have an appropriate performance in the school system. Children who struggles in reading acquisition process presents a higher rate of difficulties in their learning trajectories. There are multiples sources of these initial differences, and one of them is socioeconomic status (SES). Children who came from low SES families have more difficulties in reading acquisition process, and in Chile, which is one of the countries with the highest educational segregation in the world, these differences are huge. The aim of this project was analyze the initial state of reading precursors of children from different SES. We assessed 83 children from low SES and 83 children from high SES in five skills considered as precursors of reading. We carried out covariance analysis, controlling by gender and age. Significant differences, favorable to high SES children, were observed for phonological awareness skills, knowledge of letters, speed of naming, vocabulary and oral comprehension. Although there are some distinctions between the magnitude of these differences. The greatest gap was found in vocabulary, oral comprehension and speed of naming, and the smallest gap was related to phonological awareness and letter knowledge. These results reveal the need to implement remedial didactic strategies, which consider the development profile of the children, in order to support the development of compensatory learning trajectories in children from low SES environments.

Self-Regulatory Abilities at Kindergarten as Predictors of 4th Graders Mathematics Achievement

Keywords: Achievement, Early childhood education, Mathematics, Self-regulation

Presenting Author: Ayse Cobanoglu, University at Buffalo, United States; **Co-Author:** Fahrettin Hasan Adagideli, Istanbul University-Cerrahpasa, Turkey

The present study aims to investigate the association between early self-regulatory abilities in kindergarten and mathematics achievement at the fourth grade, controlling their mathematics abilities and socio-economic status at the end of the kindergarten. In the present study, data analysis is conducted using the public version of the Early Childhood Longitudinal Study, Kindergarten class of 2011 (ECLS-K: 2011) dataset. For math achievement, Item Response Theory (IRT) scale scores from kindergarten spring and fourth-grade waves have used. Children's self-regulatory abilities are also obtained in the spring kindergarten. While the temperamental aspect of self-regulation (i.e., effortful control: inhibitory control and attentional focusing) rated by teachers, executive functions are directly assessed via two behavioral tasks (working memory and cognitive flexibility). Findings show that aspects of self-regulation account for variation in children's fourth-grade mathematics performances holding constant SES and their initial mathematics scores. However, children's initial mathematics scores, as well as their socio-economic status, are the strongest predictor of later mathematics scores at fourth grade. Therefore, results suggest that not only children's initial mathematics scores but also self-regulatory abilities play roles on children's later mathematics performance. Findings will be discussed within the scope of mathematics achievement with possible implications.

Creating an instrument for measuring pedagogues' role in basing children's lifelong learning

Keywords: Action research, Early childhood education, Lifelong learning, Teaching approaches

Presenting Author: Nikolett Takács, University of Szeged, Hungary

One of the greatest challenges in 21st century education is to prepare pupils for lifelong learning. As being the first areas of formal learning sources, kindergartens and primary schools could effectively support the basing phase of this new approach for children. The main goal of this paper is to make it measurable, how teachers could prepare children for LLL and in future studies it will also turn out, what tools could they use in order to make lifelong learning more attainable for their pupils. By creating the instrument for measuring *Teachers' Attitudes, Participation and Preparing role in LLL* ('TAPP') two validated and reliable scales and a validated interview structure were adapted in order to create a complex measuring tool for TAPP. The research was conducted among Hungarian kindergarten teachers and primary school teachers (N=110). First pilot testing had the aim to base the development of the instrument (by increasing its reliability, validity and simplifying process by categorizing data from the open-ended questions). For further analysis, 12 hypothesis were set up along the three dimensions of the questionnaire to find similarities and differences between the two profession according to their attitudes, activities and basing children's LLL. Results of the study can lead us to collect some methodological techniques for preparing children effectively for LLL.

Designing Preschool Physical Learning Environments - The Children's Voice

Keywords: Attitudes and beliefs, Early childhood education, Mixed-method research, Science education

Presenting Author: Netta Perry, Bar-Ilan University, Israel; **Co-Author:** Esther Adi-Japha, Bar-Ilan University, Israel; **Co-Author:** Ornit Spektor-Levy, Bar-Ilan University, Israel

To foster learning, exploration and curiosity, interior and exterior learning spaces need organization and design. Considering that learning environments bear much influence on children's learning, this study sought to hear the voices of the children regarding their learning environments - preferences and perceptions - with a particular focus on Science and Nature centers. The current study is part of an extended study on a research population of 220 preschoolers (5–6 years of age). This paper presents preliminary results. During semi-structured interviews, preschoolers were asked to photograph their favorite spaces and to explain their choices. Next, children were presented with photos of three differently designed preschools, were asked to select one preferred environment, and to explain why. Findings reveal that very young children do hold preferences regarding the design of their learning environment, and they are able to discuss their preferences. When assessing the physical learning environment, the children reference both the action possibilities and the visual characteristics of the environment. When assessing the Science and Nature Center, the children are mostly interested in what they can do in the center. Their explanations show that most children enjoy the opportunity to engage in active learning, hands-on experiences, and collaborative play. These preliminary results underscore the importance of hearing preschoolers' voices when designing age-appropriate, physical learning environments, with a focus on explorative science spaces. Further data and conclusions will be presented at the conference presentation.

Session M 18

15 August 2019 08:30 - 10:00

Seminar Room - S12

Workshop

Teaching and Teacher Education

Teacher as Designer: An evidence-based model to stimulate teacher design work

Keywords: Pre-service teacher education, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Timo Leuders, University of Education Freiburg , Germany

Recognition of the design work of teachers has been a growing concept in the educational research literature for decades yet, teacher education rarely explicitly develops the knowledge and skills about design. However, to make such a change in practice we need theoretically robust and empirically-based models and tools that will support teacher design. This workshop will present the findings of an Australian multi-phase research project that studied the design practices of 48 Australian primary school teachers. Workshop participants will interact with a teacher design model that has been derived from the Activity Theory (Engeström, 2001) framing and the findings of the study. The workshop will culminate in a reflective discussion in which participants will be asked to draw upon their own research and practice experience to inform future iterations of the model.

Teacher as Designer: An evidence-based model to stimulate teacher design work

Presenting Author:Lori Lockyer, University of Technology Sydney, Australia; **Presenting Author:**Shirley Agostinho, University of Wollongong, Australia;

Presenting Author:Sue Bennett, University of Wollongong, Australia

Recognition of the design work of teachers has been a growing concept in the educational research literature for decades yet, teacher education rarely explicitly develops the knowledge and skills about design. However, to make such a change in practice we need theoretically robust and empirically-based models and tools that will support teacher design. This workshop will present the findings of an Australian multi-phase research project that studied the design practices of 48 Australian primary school teachers. Workshop participants will interact with a teacher design model that has been derived from the Activity Theory (Engeström, 2001) framing and the findings of the study. The workshop will culminate in a reflective discussion in which participants will be asked to draw upon their own research and practice experience to inform future iterations of the model.

Session M 19

15 August 2019 08:30 - 10:00

Seminar Room - S16

Single Paper

Higher Education, Lifelong Learning, Teaching and Teacher Education

Vocational Education, Learning and Professional Development

Keywords: Communities of practice, Competencies, Design based research, Higher education, Mixed-method research, Primary education, Qualitative methods, Secondary education, Teaching approaches, Teaching/instruction, Vocational education, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Nanette Seago, WestEd, United States

The Practice of Leadership: Exploring Six Paradoxes of Leadership

Keywords: Mixed-method research, Primary education, Secondary education, Vocational education

Presenting Author:Angela de Jong, Oberon research institute / Utrecht University, Netherlands; **Co-Author:**Ditte Lockhorst, Oberon research institute, Netherlands; **Co-Author:**Renske de Kleijn, UMC Utrecht, Netherlands; **Co-Author:**Jan van Tartwijk, Utrecht University, Netherlands; **Co-Author:**Mirko Noordegraaf, Utrecht University, Netherlands; **Co-Author:**Ton Klein, Oberon, Netherlands

The success or failure of educational change seems to be highly dependent on the leadership of school principals. School principals have among others the assignment to innovate schools and lead the process of change. Leading such processes is an interactive process between school principals and teachers. In the current study we aimed to empirically explore how school principals lead the process of implementing an educational innovation. Our study context is a project in which data (with questionnaires and interviews) was already gathered in primary, secondary, and vocational education of which all schools implement the same innovation program that stimulates to build a learning culture. We explored whether six innovation paradoxes can be found in these data. We found that the six paradoxes of Hill et al. (2014) fit with the data and that school leaders "flow" in their leadership practices. For instance, a school leader can decide top down to use the innovation program (high on control and confrontation) but at the same time facilitate teachers, be very involved and informed about changes in the school and focus on learning and autonomy of teachers (high on support and bottom up). This shows that school principals do not lead in a static way but that leadership entails various roles and thus leadership flows. By stressing leading flows we contribute to theory of school leadership in the context of change. Furthermore, it adds to our knowledge and practices on how to educate future school principals in their leadership role.

Student-run hospital wards: Institutionalised workplace-learning opportunities for nursing students

Keywords: Competencies, Mixed-method research, Vocational education, Workplace learning

Presenting Author:Michael Goller, University of Bamberg, Germany; **Co-Author:**Bianca Steffen, University of Paderborn, Germany

Student-run hospital wards (SHW) are institutionalised learning arrangements in which nursing students are fully responsible for the planning, organisation, and implementation of patient care within a real-existing hospital ward for a limited time frame of usually two to four weeks during their initial nursing training. This contribution investigates two particular three -week SHWs conducted over two consecutive years using a theoretically-grounded research design employing both pre- and post-test questionnaires, and interviews developed to get insights about why and how nursing students learn during their time in SHWs and what competences are developed. The data is analysed using a mixed-method approach within a replication framework (results of the first SHW will be used to test whether the findings of the first SHW can be replicated).

Educating for dynamic vocations: how to design responsive vocational education?

Keywords: Communities of practice, Design based research, Higher education, Vocational education

Presenting Author:Loek Nieuwenhuis, HAN University of Applied Sciences, Netherlands; **Co-Author:**Haske van Vlokhoven, HAN University of Applied Sciences, Netherlands; **Co-Author:**Aimée Hoeve, HAN University of Applied Sciences, Netherlands; **Co-Author:**Femke Nijland, Open University, Netherlands; **Co-Author:**Hester Smulders, ebo, Netherlands

This paper presents the results of the first data collection on how educational teams in Dutch VET organise their responsiveness towards changing educational needs in 'their' professional fields. 10 teams are joining a professional learning community, targeted at designing protocols for responsiveness. The aim of this community is to develop a more interactive approach in which school and enterprise are both actively involved in curriculum development. The presented results concern actual protocols-in-use as starting point for collective improvement. As a start the current method for curriculum development in the ten teacher teams will be described. At the same time stakeholders (students, teachers and employers) are invited to evaluate the protocol-in-use. Teachers are asked to evaluate the feasibility of the protocol in use, employers are asked to evaluate the connection of the curriculum to professional practice, and students on the perceived attractiveness of resulting educational processes.

Dealing with diverse student groups: Teaching practices of Icelandic VET teachers

Keywords: Qualitative methods, Teaching approaches, Teaching/instruction, Vocational education

Presenting Author:Elsa Eiríksdóttir, University of Iceland, Iceland

In Iceland the vast majority of each cohort of young people graduating from compulsory education enter upper secondary school. This increased attendance has in turn increased the diversity of the student population, particularly in VET programs where entry is not selective. The proposed presentation will focus on how VET teachers discuss and deal with diverse student groups through their teaching practices. The study draws on interviews with upper secondary school teachers ($N = 23$), both VET teachers ($n = 6$) and teachers of academic subjects for comparison ($n = 17$), and 16 VET classroom observations in nine different upper secondary schools in Iceland. The results show that VET teachers generally describe a highly diverse student group in terms of academic ability, learning disabilities, age, and interests. A comparison of interviews with academic subject teachers shows that student group diversity seems to be more of a challenge for VET teachers than academic teachers, especially for those who teach in more selective upper secondary schools. The results from vocational class

observations show that individualization of assignments and pacing seems the preferred pedagogical practice, sometimes resulting in repetitions for teachers and inactive waiting for students. Organized group work was rare, but examples of spontaneous collaboration among students were observed.[1] The results will be discussed in light of educational repercussions and VET teacher education.

[1] The results reported here are currently reported partly in two different manuscripts under review, but have not been discussed together before as a whole or in this context.

Session N 1

15 August 2019 10:15 - 11:45

Lecture Hall - H07

SIG Invited Symposium

Educational Policy and Systems

SIG 25: How can peer reviewing be made fair for all theoretical frameworks in EARLI and beyond?

Keywords: Mixed-method research, Qualitative methods, Quantitative methods, Researcher education

Interest group: SIG 25 - Educational Theory

Chairperson: Giuseppe Ritella, University of Helsinki, Finland

Chairperson: Antti Rajala, University of Helsinki, Finland

Organiser: Antti Rajala, University of Helsinki, Finland

Organiser: Rupert Wegerif, University of Cambridge, United Kingdom

Organiser: Giuseppe Ritella, University of Helsinki, Finland

Discussant: Antti Rajala, University of Helsinki, Finland

SIG 25 on Educational Theory organizes a panel to discuss and debate how theoretical and paradigmatic differences should be reflected in the peer review process and how 'quality' is understood in the editorial process. Peer review is a crucial part of what makes scholarly contributions scientifically legitimate. It has always been debated but under recent years these debates have become fierce, with many academics saying that peer review is in crisis. Due to the fragmentation of educational research in the postmodern times, research paradigms tend to have their own journals and publication venues characterized by distinct communities of authors and reviewers and incommensurable criteria of what counts as publishable research. This panel calls for more interaction and debate across paradigms. Such a dialogue requires that attention is paid to the ontological, epistemological and methodological frameworks underlying a given study when assessing its worth. The panel will also discuss important practical issues of peer reviewing and their implicit impact on how quality is determined, such as automated systems and management of big numbers of submissions; relations between reviewers and editors in the editorial process; the dominance of Anglo-American writing style marginalizing other national and linguistic academic traditions, especially of Global South. The panelists have been selected to represent a variety of SIGs and voices in the EARLI community. They all have experience of journal editing and some of them are currently editors in EARLI journals.

Dialogic problematization of peer reviewing in academic social science journals

Presenting Author:Ana Marjanovic-Shane, Independent Scholar, United States; **Presenting Author:**Eugene Matusov, University of Delaware, United States

In our panel discussion, we want to focus on diverse problems of peer reviewing in academic social science journals from a Bakhtinian dialogic framework. Based on our experience of participation in the Dialogic Pedagogy: An International Online Journal for the last 6 years, we have abstracted 9 major issues and tensions in the peer review process in social sciences. These 9 issues involve meta-issues of paradigmatic wars, building a culture of reviewing, oppression by positivism and by social engineering of post-truth, diversity of philosophical approaches to the editing process, ecology of academic life, inherent contradictions of the editing process, and power abuse.

Returning to dialogue on a higher level

Presenting Author:Rupert Wegerif, University of Cambridge, United Kingdom

The full quote from Bakhtin is 'dialectics was born of dialogue so as to return again to dialogue on a higher level (a dialogue of personalities)'. Journals began out of open dialogue. The first academic journals, Journal des Sçavans, and Philosophical Transactions of the Royal Society, contained a mixture of articles on every possible topic. They represented what Oakeshott has called 'the conversation of mankind'. This is an unbounded dialogue as shared inquiry which recognizes that everything is potentially relevant. However, disciplines divided and set up walls. More recently there has been a proliferation of journals. Ideally this fragmentation should return us to the original shared dialogic space at a higher level, expanded and deepened because on the other side of disciplinarity. In practice fragmentation can undermine the quality of the dialogue. New forms of multi-media science debate are emerging through blogging and social media, uncontrolled except by popularity. We need to make peer-reviewing transparent and expand it to larger interdisciplinary communities while at the same time preserving judgements of quality by experts when appropriate. We need a flexible dynamic eco-system combining more specialist and more general dialogues in the one inclusive global dialogic space. I will put forward small steps from my experience about how we can get there from here, but it is not easy or obvious!

Dilemmas of peer review and the art of constructive criticism

Presenting Author:Roger Säljö, University of Gothenburg, Sweden

Peer review in the evaluation of journal manuscripts plays a very significant role in scholarly communities. But peer review is part of research practices in other contexts as well. For instance, applications to research funding agencies are generally evaluated by experts. Critical scrutiny by peers is what gives research some of its legitimacy in the public eye. Value judgements will always be an important element of the evaluation of outcomes of research, but we need deeper insights into how this dimension of the academic system functions in order to maintain quality and trust. The art of critical but constructive reviewing should be part of the research training.

The challenge of bridging paradigms through editorial work

Presenting Author:Crina Damsa, University of Oslo, Norway

The area of research on learning and instruction has known tremendous developments in the past years, with numbers of publications increasing. Still, paradigmatic separations dominate the field and the way journals operate and engage with submitted scholarship. Hammersley (2012) believes that 'there are conflicting, even paradoxical, responses to the methodological pluralism that currently prevails in social and educational research.' But what perpetuates this paradigmatic separation, and leads journals to adhering to rigid criteria, in an era when scholars are encouraged to employ diverse methodologies and engage in a more sophisticated understanding of phenomena? This contribution will attempt to problematize the work of editors and reviewers, who hold a key position in framing the orientation and emphasis of many published works, together with the nature of the interaction between those involved in warranting the work; and the role of the authors in positioning themselves and their work. As associate editor of a journal that tries to provide an arena for cutting edge and innovative research, regardless of type of study, paradigmatic positioning or methodological approach, I recognize the challenge to engage in a constructive review process that provides opportunities to display work with potential, without adhering to strict paradigmatic positioning. The panel discussion will provide the opportunity to discuss whether strict delimitations actually contribute to advancement of research in our field or whether cross-paradigmatic linkages and methodological interdisciplinarity should be customary, both in how we approach the review and editorial process and in our scholarship in general.

Peer review of technical quality of quantitative and qualitative research.

Presenting Author:Lars-Erik Malmberg, University of Oxford, United Kingdom

With even increasing demands on quality of research posed by journals, editorial teams and reviewers (e.g., design, sampling, data quality control, analytic methods) it is important to reflect on our criteria for quality of research. Many journals have abandoned cross-sectional designs relying solely on self-report measures, while some journals have abandoned studies which do not include standardized instruments. Many journals prefer longitudinal, multiple-reporter and

multiple-method designs. There is a movement toward pre-registering experimental designs. While there is a host of quantified measures of quality for questionnaires, observation-instruments and standardized tests (e.g., confirmatory factor analyses, internal consistency, item response models) some "equivalents" have been proposed for qualitative studies, i.e., studies in which open-ended responses have been coded using a coding-grid. Multiple procedures have been proposed: for example (a) accuracy and rigour of transcripts, (b) triangulated data of the same phenomenon (e.g., artefacts, drawings, video coverage, and field notes; (c) inter-rater agreement based on the unit of analysis (e.g., word, line, section, paragraph). I will discuss modern criteria of establishing (technical) quality quantitative and qualitative research through the lens of construct validation (Campbell & Fiske, 1959; Gibson & Dembo, 1984), and reflections on the many concepts used for establishing quality in qualitative research, e.g., truthfulness, trustworthiness, credibility, transferability, dependability, confirmability, and authenticity (Golafshani, 2003; Guba & Lincoln, 2005). I will focus on the technical side of assessing quality, assuming that theoretical and conceptual issues, and contribution to the field of a particular study are established.

Session N 2

15 August 2019 10:15 - 11:45

Lecture Hall - H05

SIG Invited Symposium

Motivational, Social and Affective Processes

SIG 22: Emotional influences on the neural mechanisms of learning

Keywords: Attitudes and beliefs, Cognitive development, Emotion and affect, Motivation and emotion, Neuroscience

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Sabine Peters, Netherlands

Organiser: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Organiser: Sabine Peters, Netherlands

Discussant: Lydia Krabbendam, Vrije Universiteit Amsterdam, Netherlands

A wealth of research in the field of educational neuroscience has focused on the underlying neurocognitive processes of learning. However, insights from educational psychology suggests that emotional processes may be at least as important for learning and school performance. Relatively few studies have investigated the emotional influences on the neural mechanisms of learning. The aim of the present symposium is to (a) provide an overview of the current evidence on effects of emotion on learning and its neural mechanisms, and (b) to critically discuss the potential impact of these findings for education. The four talks in this symposium cover both positive and negative effects of emotion on learning: factors such as test-related anxiety and a fixed mindset may impair learning, whereas factors such as increased arousal and the freedom to make autonomous choices during learning may benefit learning performance. The effects of these emotional processes are studied at multiple levels, ranging from controlled laboratory settings (e.g. performance monitoring) to more real-world learning settings (e.g. mathematics test performance), and the four talks include a wide range of state-of-the-art neuroimaging techniques. The discussant of the symposium will integrate the presented evidence and initiate a discussion on the potential implications of these findings for understanding learning beyond the cognitive aspects, and the value of the ensuing insights for the educational practice.

Don't worry: Error monitoring of test-anxious students under performance pressure

Presenting Author:Frieder Schillinger, Technische Universität Dresden, Germany; **Co-Author:**Clemens Brunner, University of Graz, Austria; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Roland H. Grabner, University of Graz, Austria

Test anxiety can hinder students from achieving their full potential in tests and examinations. Evidence suggests that performance-related worries impair the working memory of these students. To date, little is known about how worries affect the error monitoring of test-anxious students. This is surprising given that monitoring responses and adapting to errors is key to excel in a test situation. Here, we address this question by comparing the error-related negativity (ERN) between a group of high test-anxious (HTA) and low test-anxious (LTA) university students performing a numerical Stroop task. The ERN is an event-related potential (ERP) that emerges shortly after an error has been committed. Whereas performance pressure significantly modulated the ERN in the HTA group but not in the LTA group, task performance did not differ between groups. Contrary to expectation, the amplitude of the ERN was not related to worries during the task as assessed by a Faces Anxiety Scale (FAS). Results suggest that test-anxious students show increased compensatory effort to maintain task performance after committing an error in a test situation.

Physiological mechanisms of the role of ability beliefs in effort, stress and failure attribution

Presenting Author:Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands; **Co-Author:**Smiddy Nieuwenhuis, VU University Amsterdam, Netherlands; **Co-Author:**Tieme Janssen, Vrije Universiteit Amsterdam, Netherlands

Making mistakes is inherent to learning. Students, however, may hold different views on what these mistakes mean to them. Past research shows that students may have different ability beliefs and goal orientation. Some students think abilities are malleable with effort (incremental belief) and aim to improve themselves (learning goals), while others believe abilities are fixed and cannot change with effort (entity belief) and aim to prove themselves (performance goals). The current study ($N=117$, Dutch undergraduate students) addresses the underlying (electro)physiological correlates of confrontation with errors and helpless attributions (measured with self-reported questionnaires), in relation to ability beliefs. Physiology (Electrocardiogram; ECG) and Encephalo-Electrograms (EEG) were measured during the Math Effort Task (MET). During the MET, students solve 5 runs of 10 arithmetic problems with a difficulty level of their own choice. After the MET, helplessness attributions are measured to investigate whether individuals attribute their mistakes during the task towards a cause beyond their control. Results indicate that individuals with incremental beliefs on average chose higher difficulty levels and reported less helplessness attributions than individuals with entity beliefs. Our study will increase our understanding of affective processes during school tasks, and shed more light on the impact of a students' self-beliefs on effort investment, stress and failure attribution during math exercises.

Decision-making enhances episodic memory via mesolimbic engagement

Presenting Author:Vishnu Murty, Temple University, United States

Individuals value the opportunity to make decisions and exert control over their environment. Animal and human studies alike have shown that enhancing the value of memoranda increases memory via engagement of mesolimbic dopamine and episodic memory systems. In this talk, I will present a series of behavior and neuroimaging studies characterizing how decision-making engages mesolimbic systems resulting in a downstream increase in episodic memory. First, I will show that simply giving individuals the ability to make decisions during learning reliably enhances 24-hour memory (i.e., decision-related memory enhancements). Next, I will show neuroimaging data showing that these decision-related memory enhancements are predicted by mesolimbic-hippocampal interactions during encoding and markers of systems-level consolidation. Finally, I will show that decision-related memory enhancements are predicted by individuals' subjective sense of increased valuation for the learning context. These findings support a model by which episodic memory can be enhanced by imbuing individuals with the opportunity to make decisions during learning. Further, the findings provide a novel behavioral manipulation to engage mesolimbic neuromodulation over the hippocampus, and provide the foundation to generate novel learning interventions which are amenable to academic contexts—increasing student's agency in academic environments.

How emotion affects the learning-memory processes.

Presenting Author:Michiko Sakaki, University of Reading, United Kingdom

How can we improve our learning and memory? When asked this question, we tend to focus on what we do during learning, such as learning strategies, levels of processing and repetition. But human memory and learning are affected not only by these cognitive factors but also by emotional states. In fact, decades of research demonstrates that events or materials that induce strong emotional arousal are remembered better than other ordinary events or materials, suggesting

that emotion can enhance memory. Recent research further indicates that the effects of emotion go beyond materials that evoke the emotional states. Specifically, moments of high arousal induced by encountering emotional events affect not only the way we remember the emotional events but also the way we remember other events that happen earlier than the emotional events. These post-learning effects of emotion are not always beneficial, such that emotion sometimes appears to facilitate learning but sometimes appears to impair learning. During my presentation, I will discuss recent studies on the question of when emotion enhances memory and learning and when emotion impairs memory and learning. I will also cover the neural mechanisms underlying such complex effects of emotion.

Session N 3

15 August 2019 10:15 - 11:45

Lecture Hall - H08

SIG Invited Symposium

Learning and Social Interaction

SIG 10: Learning as material formation

Keywords: Action research, Arts, Collaborative Learning, Developmental processes, Emotion and affect, Ethnography, Higher education, Lifelong learning, Out-of-school learning, Qualitative methods, Social interaction, Student learning, Technology, Video analysis, Workplace learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Nathalie Muller Mirza, Université de Lausanne, Switzerland

Organiser: Asa Makitalo, University of Gothenburg, Sweden

Discussant: Alfredo Jornet Gil, University of Oslo, Norway

Most studies of learning tend to rely on theoretical distinctions and methodological principles that separate not only the human subject from objects or things, but also content from matter and form. Anthropological, sociocultural, sociomaterial and multimodal approaches all have means to bridge such dichotomies and have introduced alternative analytical accounts to study learning as processes of becoming. This symposium aims to further qualify such efforts and discuss how we analytically account for materiality in studies of learning. While learning can be analysed by following material-semiotic processes of inscription and design (i.e. how we learn to impose form onto matter), how can we more seriously take into account the textures of experience we gain from working with material formations?

Designing Learning Experiences: An exploration of learning as material formation in fashion design

Presenting Author: Todd Nicewonger, Virginia Tech, United States

This presentation draws on two and half years of ethnographic fieldwork among fashion design students and teachers in western Europe. The curriculum used to train these students emphasizes the creation of inspirational sources as conceptual starting points for the development of wearable design forms. Through these practices students learn to identify interrelationships among the body, sociality, and fashion by experimenting with inspirational material and immaterial sources. These sources are collected from students own lived experiences as well as through research. In the process of carrying out these experiments students learn to transform inspirational sources into aesthetic forms and objects that they can later use to develop the wearable designs of their collections. What I want to draw attention to in this presentation is how these experiments serve as intermediate staging grounds for learning through material formation. In doing so, I will present three different examples, which I will analyze in dialogue with socio-cultural theories on learning and expertise. Next, I will extend this discussion to the field of transdisciplinary studies where scholars are experimenting with design methods to cultivate transdisciplinary activities for expanding the capacity of research teams. In making this connection I seek to provide descriptive insights into the learning processes of designers, while also situating these examples within wider efforts to break down disciplinary barriers and generate new methods for producing collective knowledge and inquiry.

Students' dialogical reconstruction of experience: a sociomaterial perspective

Presenting Author: Elisa Cattaruzza, Institute of Psychology & Education, University of Neuchâtel, Switzerland; **Co-Author:** Antonio Iannaccone, University of Neuchâtel, Switzerland

Examining the dynamic process of materialization – including material and discursive practices – through which things emerge and act (Fenwick, 2015), we adopt a sociomaterial perspective that decenters the individualized human as the strict focal point for psychology and education. We consider the material-dialogic relationship (Hetherington & Wegerif, 2018) by analyzing discourse and matter as a whole in the students' learning process. The research context presented in this research was two semester-long courses attended by 40 master-level students of the University of Neuchâtel (Switzerland). During the courses, hands-on activities were provided focusing on the design and set up of four workshops opened to citizens, in particular to children (aged 4–11 years) and their parents in collaboration with a cultural association. The empirical data presented in this paper are drawn from five audiotape-recorded focus groups, each lasting about 1 hour, conducted by three course teacher-researchers at the end of the semester. The focus groups were transcribed and analyzed to observe how students interpret and re-construct their workshop experience. Findings show how students' dialogical reconstruction of experience, connected to their role during the activity, is intertwined with the sociomaterial activity and how students developed a greater awareness of their work through a description of their *opaque* experience (Cesari, Iannaccone, Mollo, 2015 ; Mouchet, Cattaruzza, 2015). Theoretical and methodological implications for research on learning and education will be discussed.

How moments add up to lives: Flat CHAT assemblage, embodiment, and lifespan becoming

Presenting Author: Paul Prior, University of Illinois at Urbana-Champaign, United States

Asking how multiscale development produces both persons and societies, Lemke (2000) highlighted "the circulation of semiotic artifacts (i.e., books, buildings, bodies) that enables coordination between processes on radically different timescales" (p. 275). A Flat CHAT assemblage perspective (Prior & Olinger, 2019; Smith & Prior, under review) argues such circulations depend on a rhizomatic, dialogic, material-historic architecture for *becomings* (Barad, 2007). Rejecting neo-Platonic reserves that escape relentless material motion, Flat CHAT assemblage means that no societies, languages, norms, discourse communities, activity systems, cognitive structures, or genetic codes sit placidly above the dispersed constantly flowing movement of historical materialities. Lifespan becoming then happens as embodied moments are dynamically, temporally but temporarily, accumulating and shedding. In this paper, I draw on a lifespan case study of a biologist to explore how affective intensities (Leander & Boldt, 2013) across moments built not only this trajectory of becoming a biologist but implicated the human and non-human networks through which that trajectory becomes textured into a recognizable lifeworld. Based on interviews (life-history, semi-structured, and text-based), participant observation, a collection of texts that reach back to elementary school, and memory, I trace *resonances* (Storaiuolo, Smith, & Phillips, 2017) across four moments in her becoming: a family pretend game focused on imaginatively saving animals, a response at age 5 to an episode of a documentary nature program, a day in a forest in Uganda with field guides observing a group of monkeys, and an interaction as she was writing an article that would become part of her dissertation.

Textures of experience in professional practice: Learning from working with material formations

Presenting Author: Asa Makitalo, University of Gothenburg, Sweden

By following categorizing practices, inscription and design in the fields of endodontics, hypertension care, social work and IT support, the author of this paper has recurrently focused on learning as triggered by observable gaps between action and expectation in the coordinated flow of situated activities. This paper aims to further explore how *textures of experience* from working with material formations, can be productively conceptualized and analyzed by revisiting two earlier studies of sites arranged for learning: Case studio talk in a global IT support team, and focus group discussions with professional dentists specialized in endodontics. By noticing and revisiting earlier events and activities, and by re-minding professionals of their situated concerns, particular textures of experiences are made salient as work with material formations.

Session N 4

15 August 2019 10:15 - 11:45

Seminar Room - S09

Single Paper

Higher Education, Motivational, Social and Affective Processes

Quantitative Methods in Educational Psychology

Keywords: Attitudes and beliefs, Culture, Educational Psychology, Emotion and affect, Higher education, Motivation, Quantitative methods

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Carmel Mesiti, University of Melbourne, Australia

Choosing a study program: The role of school subject-specific motivational beliefs

Keywords: Educational Psychology, Higher education, Motivation, Quantitative methods

Presenting Author: Julia Gorges, Bielefeld University, Germany

Drawing on expectancy-value theory, the present study investigated the role of school subject-specific motivational beliefs—i.e., self-concepts of ability and intrinsic task value—in anticipating motivational beliefs regarding field-of-study-specific motivational beliefs when the field of study is unknown to the individual. According to the generalization hypothesis, students' school subject-specific motivational beliefs are expected to predict their field-of-study-specific motivational beliefs. The predictive validity of school subject-specific motivational beliefs, in turn, should depend on the extent of perceived similarity between the school subject and the unknown field of study. Based on an online survey of $N = 582$ students, results from structural equation modeling support the assumption that school subject-specific motivational beliefs predict field-of-study-specific motivational beliefs if individuals' perceive known and unknown learning content as being similar. In addition, regression analyses support the hypothesized moderating effect of the extent of perceived similarity on the predictive validity of school subject-specific motivational beliefs for field-of-study-specific motivational beliefs. Hence, the extent of perceived similarity increased the predictive validity of school subject specific motivational beliefs increased. Results are discussed in terms of expectancy-value theory and practical implications for student counselling.

Academics' epistemic stances and formative cultures

Keywords: Culture, Educational Psychology, Higher education, Quantitative methods

Presenting Author: Kathryn Bartimote-Aufflick, The University of Sydney, Australia; **Co-Author:** Peter C. Thomson, The University of Sydney, Australia

In this study the relationships between epistemic stance and culture were examined. Epistemic stance is the personal theory one holds in relation to knowledge and knowing, and represents an integrated system of beliefs in relation to several important issues in epistemology. Stance was studied as an unordered categorical variable, assuming all stances hold equal merit. The framing of the study and the methodology were informed by critical realist ideas. This added to the richness of this quantitative exploration of potentially formative cultural communities and experiences for academics. The relationship between the epistemic stances of academics and a range of sociocultural factors was explored via a person-centred analysis approach, using data collected via a survey developed for the study. Complete responses were received from 462 academic staff members and PhD students from four large research-intensive Australian universities across eight disciplines. The results indicate that the family, religious groups, disciplinary communities, organizational structures (e.g. university departments and institutions), and university courses are all potentially formative environments for academics' epistemic stances. Further, some experiences of remaining or moving between cultural communities seem important, as do experiences of continuity within one cultural community versus experiences of multiplicity. Discipline had the closest linkage with epistemic stance, followed by family and religion. An academic's current discipline was shown to be important, but also previous disciplines they had taught or researched in, as well as their undergraduate major area. Only three out of the eight disciplines studied here were dominated by one particular stance.

Emotional anticipation of the school-to-work transition: A latent profile analysis.

Keywords: Educational Psychology, Emotion and affect, Higher education, Quantitative methods

Presenting Author: Michaël Parmentier, Université Catholique de Louvain (UCL), Belgium; **Co-Author:** Thomas Pirsoul, Université Catholique de Louvain (UCL), Belgium; **Co-Author:** Frédéric Nils, Université catholique de Louvain (UCL), Belgium

Job and career transitions, such as the school-to-work transition, have been widely considered as emotional and stressful in nature (Kidd, 2004). Nevertheless, research on emotion in career primarily focuses on individual differences (e.g., emotional intelligence), trait affect or felt emotions during a career event. Emotion, however, can also influence career behavior when they are related to the anticipation of an event and the prediction of its consequences for the individual (Gilbert & Wilson, 2007). In this research, we investigate how last year university students emotionally anticipated their school-to-work transition and whether we could identify groups of students that differ in terms of emotional anticipation using latent profile analysis. Specifically, we focus on anticipatory emotions defined as currently felt emotions to the prospect of a future event and its consequences for the individual. The data were collected among 307 last year university students 9 months before their transition. The latent profile analysis yielded to a 4-profiles solution that best fitted our data. The two first profiles are composed of students with low (high) levels of both positive and negative anticipatory emotions. The two last profiles are composed of students with high (low) levels of positive and low (high) levels of negative anticipatory emotions. Additional analyses further showed that emotional competence and career adaptability predict profile membership. In terms of implication, the identification of groups of students with different emotional anticipation profiles could help to better design and implement specific career interventions or university practices.

Youth Purpose and Interest Development: A Middle School Science Intervention Strategy

Keywords: Attitudes and beliefs, Educational Psychology, Motivation, Quantitative methods

Presenting Author: Jessica Summers, University of Arizona, United States; **Co-Author:** Lia Falco, University of Arizona, United States; **Co-Author:** Ashley Batchelor, University of Arizona, United States

An intervention called AquaSTEM which uses a context-based approach to increase situational interest for middle school environmental science and water science was provided by eight teachers in the Southwestern United States. AquaSTEM focuses on systems thinking, employing a water-oriented theme to improve STEM learning and engagement. Results indicate that an increase in situational interest based on AquaSTEM lessons (pre-post) significantly mediated sixth grade students' sense of youth purpose (pre) and their general individual interest in science (post). Youth purpose is defined as a stable and generalized intention to accomplish something that is at once meaningful to the self and leads to productive engagement with some aspect of the world beyond the self" (Bronk, p. 2, 2011; Damon, 2009; Damon, Menon, & Bronk, 2003). Purpose is a critical construct in this model if educators are to consider students' ability to view content as personally meaningful and connect it to real-world concerns and future community impacts beyond the self. This is particularly relevant for underrepresented students if we are to expect long-term interest development in future STEM courses and careers beyond a short-term intervention.

Session N 5

15 August 2019 10:15 - 11:45

Seminar Room - S11

Single Paper

Cognitive Science, Higher Education

Metacognition

Keywords: Argumentation, Cognitive development, Emotion and affect, Higher education, Literacy, Mathematics, Metacognition, Misconceptions, Primary education, Problem solving

Interest group: SIG 04 - Higher Education, SIG 16 - Metacognition, SIG 27 - Online Measures of Learning Processes

Chairperson: Dirk Tempelaar, Maastricht University, Netherlands

Mathematics Problem Solving in Primary Education: Self-perceived Performance and process

Keywords: Mathematics, Metacognition, Primary education, Problem solving

Presenting Author: Estrella Fernandez Alba, University of Oviedo, Spain; **Co-Author:** Celestino Rodríguez, University of Oviedo, Spain; **Co-Author:** Débora Arceas, University of Oviedo, Spain; **Co-Author:** Trinidad Garcia, University of Oviedo, Spain

The current study aim to examine the process involved in solving mathematical problems to see whether they can be better understood in terms of recursion or of linearity, and to analyze whether this process is related to students' actual and self-perceived performance in problem-solving. A sample of 524 students took part in the study, with ages between 10 and 13 years old when performing two mathematical tasks. We describe the process and analyze the relationship between these processes and students' actual and self-perceived performances in the mathematical problems. The results showed that variables related to linearity –but not recursion- of the process were associated with actual performance in the task, which implies that there are more complex relationships to yet establish. The use of planning strategies before execution and the use of revision strategies after this phase were both significantly related to good performance, even if rates of success were low.

Searching for information in a text: the role of text structure, strategies and emotions in children

Keywords: Emotion and affect, Literacy, Metacognition, Primary education

Presenting Author: Elise Tornare, University of Poitiers, France; **Co-Author:** Anna Potocki, Université de Poitiers, France; **Co-Author:** Christine Ros, CeRCA UMR7295 Université de poitiers, France; **Co-Author:** Julie Ayroles, University of Poitiers, France; **Co-Author:** Jean-Francois Rouet, University of Poitiers, France

We investigated the influence of text structure on 5th grade students' information search strategies and their epistemic emotions. Twenty-six children read and searched documents, varying with respect to their presentation structure, in order to answer a question requiring to find a specific piece of information in the document. One document structure consisted of scattered paragraphs introduced with headings, the other in a linear presentation of the paragraphs. Preliminary results suggest that organization of text within the document (scattered with headings vs. linear structure) impact children task performance. The number of correct responses was higher and search times were lower when the document consisted of paragraphs with headings as opposed to continuous text. Self-reported epistemic emotions and eye movement data were analyzed to gain insight into children strategy use during search of documents with different structures.

Teaching quality as an interprofessional engagement for developing scientific thinking

Keywords: Argumentation, Cognitive development, Higher education, Metacognition

Presenting Author: Ines Langemeyer, Karlsruhe Institute of Technology, Germany

Measuring or simply objectifying teaching quality has often been judged as a paradox (cf. Bellmann, 2011). However, the research into the development of scientific thinking (cf. Piaget, 1970; Vygotsky, 1987; Kuhn, 2005) provides a substantial basis for investigating teaching quality (TQ) in higher education (HE) systematically. Against this backdrop, a model of TQ is created so that HE-research can elaborate a broad empirical research strategy. This model combines investigations of both, personal interaction (such as instruction, didactical settings etc.) directed towards short-term goals (achievements in tests, performance in presentations etc.) and collaborative interprofessional engagement (regarding the implementation of a curriculum or program) directed towards long-term goals (domain-specific and general metacognition and the enculturation into science). The paper argues that this conception of TQ can be derived from the developmental *resources* that are necessary for acquiring scientific thinking skills and from the didactic strategies *to overcome developmental constraints*. The paper will present several diagnostic tools to identify competence levels on the one hand and developmental constraints on the other. It will show how they can be used for enhancing teaching and learning in HE.

Children's Metacognitive Skills on Math Equivalence Problems

Keywords: Mathematics, Metacognition, Misconceptions, Primary education

Presenting Author: Lindsey Nelson, Indiana University, United States; **Co-Author:** Emily Fyfe, Indiana University, United States

Metacognition—the knowledge, monitoring, and regulation of cognition—is central to children's cognitive development. However, there is conflicting evidence about children's ability to accurately monitor their performance and subsequently control their behavior in response to their monitoring. Previous work suggests that children undergo developmental improvements over time and that control (i.e., decision-making at the task-level) becomes better connected to monitoring (i.e., awareness of cognitive processes and performance) in the process. This is of particular interest for mathematics topics on which children exhibit persistent misconceptions. Accordingly, this study used a cross-sectional design to investigate metacognitive regulation in first-, second-, and third-grade children ($N = 52$, ages 6.7 – 9.8 years). It focused on math equivalence problems (e.g., $2 + 3 = 1 + \underline{\quad}$), which have operations on both sides of the equal sign. We assessed children's ability to monitor their certainty (e.g., *how sure do you feel that you solved this problem right?*) and their inclination to ask for help (i.e., by pressing a hint button). Results revealed that children were exceedingly confident—even when their answers were incorrect—but their help-seeking decisions were largely strategic. In contrast to previous research, we did not observe developmental differences in accurate monitoring or strategic help-seeking. Additionally, children's monitoring was at the lower bound of what has previously been reported. This suggests that elementary school children may face unique metacognitive challenges for topics in which they have persistent misconceptions.

Session N 6

15 August 2019 10:15 - 11:45

Seminar Room - S06

Single Paper

Motivational, Social and Affective Processes

Motivation

Keywords: Comparative studies, Educational Psychology, Goal orientation, Higher education, Mathematics, Motivation, Primary education, Researcher education, Science education, Social aspects of learning and teaching, Survey Research, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Penelope Watson, University of Auckland, New Zealand

Cultivating future researchers: motivating students for research as a first step towards success?

Keywords: Higher education, Motivation, Researcher education, Survey Research

Presenting Author: Floris van Blankenstein, Leiden University Medical Center, Netherlands; **Co-Author:** Belinda Ommering, Leiden University Medical Center, Netherlands; **Co-Author:** Friedo Dekker, Leiden University Medical Center, Netherlands

Research is key for development. Certain domains, like medicine, face a shortage of researchers. Higher education could develop researchers by stimulating student engagement in research. Motivation is important when it comes to engaging students in research. Motivational theories, like Self-Determination Theory, suggest prerequisites for motivation. Consequently, studies examine motivation for research as a key parameter of success. However, many studies lack investigating if students act upon their self-reported motivation. Therefore, this study aims to examine how motivation for and actual involvement in research are related.

We surveyed first-year medical students at the start of medical training. Students were followed during their bachelor's program to identify research involvement during their second year. Logistic regression analyses were used to examine influences of intrinsic and extrinsic motivation on research involvement. Out of the 316 approached students, 315 participated in the survey (99.7%), of whom 55 became involved in research (17.5%). Intrinsically motivated students were more often involved in research ($OR=3.4$, $95\%CI=2.07-5.58$). This effect remained after adjusting for gender, age, pre-university activities, self-efficacy,

perceptions, and curiosity (adj. OR=2.5, 95%CI=1.34-4.76). The effect of extrinsic motivation (OR=1.4;95%CI=0.96-2.11) disappeared after adjusting for the abovementioned factors (adj. OR=1.05;95%CI=0.67-1.63). Moreover, the effect of intrinsic motivation remained after adjusting for extrinsic motivation, whereas the effect of extrinsic motivation disappeared after adjusting for intrinsic motivation. Intrinsic motivation increases the odds of research involvement substantially, also after adjusting for multiple possible confounding factors. Therefore, intrinsically motivating students for research could indeed be seen as a first step towards success.

Need-supportive Teaching and Motivation of Gifted and Non-gifted Students in Regular Primary Schools

Keywords: Motivation, Primary education, Social aspects of learning and teaching, Teaching/instruction

Presenting Author: Lisette Hornstra, Utrecht University, Netherlands; **Co-Author:** Anouke Bakx, Fontys University, Radboud University, Netherlands; **Co-Author:** Sven Mathijssen, CBO Talent Development, Nijmegen, Netherlands; **Co-Author:** Jaap Denissen, Department of Developmental Psychology, Tilburg University, Netherlands

For teachers of heterogeneous regular classrooms, it can be challenging to create an optimally challenging and motivating learning environment for gifted students. Lack of motivation has often been found to be an underlying cause of underachievement in gifted students. According to the self-determination theory (SDT), students' motivation can be fostered when students' basic psychological needs for autonomy, competence, and relatedness are satisfied. Teachers can satisfy these needs by the provision of autonomy support, structure, and involvement, respectively. However, research on need-supportive teaching among gifted students is scarce. The first aim of the present study was to examine whether teachers in regular primary school classrooms provided gifted and non-gifted students with similar levels of need support, and whether gifted students and non-gifted students also experienced similar levels of need satisfaction. The second aim of the present study was to examine whether the associations between need satisfaction and student motivation were similar for gifted and non-gifted students. Questionnaires were filled out by 1975 students in upper primary school and their teachers (n=80). Two-hundred-and-four students (10.5%) were diagnosed as gifted or considered gifted by their teachers. Teachers reported that they provided gifted students with more autonomy and equal levels of structure and involvement compared to non-gifted students. Gifted students perceived equal levels of autonomy support and relatedness with their teachers, but reported more competence satisfaction, and less relatedness with their peers, compared to non-gifted students. Finally, relations between need satisfaction and students' motivation were equally positive for gifted and non-gifted students.

Developing Expectancy-Value Motivational Scale in Mathematics: A Comparative Approach

Keywords: Comparative studies, Mathematics, Motivation, Primary education

Presenting Author: Jelena Radisic, University of Oslo, Norway; **Co-Author:** Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:** Ksenija Krstic, University of Belgrade, Serbia; **Co-Author:** Kajsa Yang Hansen, University of Gothenburg, Sweden; **Co-Author:** Anu Laine, University of Helsinki, Finland; **Co-Author:** Riikka Mononen, University of Oslo, Norway; **Co-Author:** Aleksander Baucal, University of Belgrade, Serbia; **Co-Author:** Lourdes Mata, Instituto Universitário / CIE - ISPA (Research Center in Education), Lisbon, Portugal

The paper focuses on developing and validating Expectancy-Value Motivational Scale (EVMS), taking a comparative approach in connection to the mathematics as a domain. Nine hundred thirty students in grade three from Norway, Finland, Serbia, and Portugal took part in the research. The choice of two Nordic and two countries from the South of Europe has allowed us to observe students across very different educational and societal settings, as well as cultural traditions in connection to practices in learning mathematics. Results indicate a good model fit in accordance with the theory for a 16-item solution, across the countries involved in the study and the individual country level. The scalar invariance was established. The particular significance of the results lies in capturing all four motivational dimensions in relation to mathematics as a subject. This confirms that students, as early as grade three are able to reliably answer items relative to different value aspects, without excluding those describing what they have to give up when involved in a task. Results on measurement invariance contribute deeper cross-country comparisons and understanding how students build own achievement task values.

Interplay Between Achievement Goals and Goal Structures: Effects on Achievement and Motivation

Keywords: Educational Psychology, Goal orientation, Motivation, Science education

Presenting Author: Anders Hofverberg, Umeå University, Sweden; **Co-Author:** Mikael Winberg, Umeå University, Sweden

Research has shown direct and indirect effects of students' achievement goals and classroom goal structures on school performance and motivation. However, whether, and how, the effects of students' achievement goals depend on classroom goal structures has not received much attention. Moreover, extant studies have not accounted for nonlinear effects, which may mask matching effects between goals and structures. Our study aims at providing a nuanced picture of the direct, interaction, and nonlinear effects of achievement goals and goal structures on students test performance and motivation in chemistry. Multiple linear regression in combination with response surface plots were used in the analysis of questionnaire data from 909 students involved in a cross-sectional survey in Grades 6-10. Results indicate that interactions between goals are more influential on student achievement and motivation than interactions between goals and structures. No evidence for a general matching effect between goals and goal structures was found. Mastery goals were universally beneficial, but in particular when students were low in performance goals and the perceived performance structure was weak. Overall, it seems that the influence of classroom goal structures on the effect of achievement goals may be smaller than previously assumed.

Session N 7

15 August 2019 10:15 - 11:45

Seminar Room - S07

Single Paper

Assessment and Evaluation, Higher Education, Teaching and Teacher Education

Quantitative Methods in Teacher Professional Development

Keywords: Assessment methods and tools, Comparative studies, Experimental studies, Higher education, Problem solving, Quantitative methods, Social interaction, Student learning, Teacher professional development, Vocational education

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Deborah Yapp, University of Utrecht, Netherlands

Do Teachers Consider Advice? On the Acceptance of Computerized Expert Models

Keywords: Assessment methods and tools, Experimental studies, Quantitative methods, Teacher professional development

Presenting Author: Esther Kaufmann, University of Education Zurich / University of Zurich, Switzerland; **Co-Author:** David V. Budescu, Fordham University, United States

Due to the importance of teachers judgment accuracy in their daily school live, judgment and decision-making is a key-component in teacher education programs. Importantly, the literature suggests that simple expert (mathematical) models can improve the quality of decisions, but people are not always eager to accept and endorse such models. We ran three online experiments to test the receptiveness to advice by computerized expert models by middle and high school teachers (N = 435). Teachers evaluated student profiles that varied in several personal and task relevant factors. They were offered (Studies 1 and 2), or could ask for (Study 3), advice from either expert models or human advisors. Overall, teachers requested and followed advice of expert models less frequently than advice from humans. Task relevant factors (task difficulty) seem to be more salient than personal factors for the willingness to receive advice.

Changing Today's Higher Education with Flipped Classroom for the Future: Student Perception

Keywords: Higher education, Quantitative methods, Student learning, Teacher professional development

Presenting Author: Erkkö Sointu, University of Eastern Finland, Finland; **Presenting Author:** Teemu Valtonen, University of Eastern Finland, Finland; **Co-Author:** Jenni Kankaanpää, University of Eastern Finland, Finland; **Co-Author:** Laura Hirsto, University of Helsinki/ University of Eastern Finland, Finland; **Co-**

Author:Kati Mäkitalo, University of Oulu, Finland

New approaches of pedagogy in higher education (HE) are sought for to change teaching towards more student-centered learning. One possibility is Flipped Classroom (FC), a pedagogical approach where the lectures still exist but are arranged with the help of technology and digital learning environments. The use of technology allows the use of lectures in more unrestricted ways with more time and location flexibility. Furthermore, the FC approach prepares students beforehand for the contact meetings (i.e. classes, demonstrations), engaging them towards a more active learning experience. In addition to learning the actual content, FC approach can be an important factor in learning the 21st century skills. To change the teaching and learning culture in HE, support and guidance for teachers to implement FC approach in their teaching should be ensured. The main question is how well does large-scale development work with FC approach enhance HE students' 21st century skills? Student data ($N=317$) from 16 different university courses were used to investigate FCs possible influence on the students' 21st century skills. With the quasi-experimental pre-post-test design, we found out that there are small to intermediate effects on these skills. Theoretical and educational significance is discussed on this paper.

Results of an Evaluation Study of Vocational Teachers in the Field of Automation Technology

Keywords: Problem solving, Quantitative methods, Teacher professional development, Vocational education

Presenting Author:Pia Schäfer, TU Kaiserslautern, Germany; **Co-Author:**Felix Walker, Technical University of Kaiserslautern, Germany; **Co-Author:**Nico Link, TU Kaiserslautern, Germany

The research project has the aim to develop and evaluate a teacher training concept in the field of automation technology. We want to figure out which effects the teacher training has on the development of the professional knowledge of the participating vocational teachers. The project has a quasi-experimental pre-posttest design. The participants will be divided into two groups, an experimental and a control group. The experimental group get an additional instruction and information on a special form of feedback, the informative tutorial feedback. Through this difference between the groups we assume a higher development of the professional knowledge (especially in the pedagogical content knowledge and the pedagogical knowledge) of the participants of the experimental group in comparison with the control group. In the contribution we will present the teacher training concept and the first results of the main study.

Educational knowledge and mentoring within traditional and alternative teacher training

Keywords: Comparative studies, Quantitative methods, Social interaction, Teacher professional development

Presenting Author:Stefanie Morgenroth, University of Duisburg-Essen, Germany; **Presenting Author:**Eva Anderson-Park, University of Duisburg-Essen, Germany; **Co-Author:**Hermann J. Abs, University of Duisburg-Essen, Germany

This paper focuses on the role of mentoring in relation to the educational knowledge gain of beginning teachers within traditional and alternative pathways of teacher training. Longitudinal Data were collected as part of a quasi-experimental study in the realm of the EU-project "A New Way for New Talents in Teaching" (NEWTT) in two countries, Austria and Bulgaria. Results in both countries show a higher educational knowledge gain for participants within the alternative pathway after two years. This also applies for the amount of mentoring. However, no additional effect was found of reflection with a mentor on the pedagogical knowledge after two years. The relevance of these results will be discussed regarding the further development of the traditional teacher Training.

Session N 8

15 August 2019 10:15 - 11:45

Seminar Room - S01

Single Paper

Learning and Social Interaction, Learning and Special Education

Early Childhood Education

Keywords: At-risk students, Attitudes and beliefs, Early childhood education, Ethnography, Motivation, Numeracy, Peer interaction, Qualitative methods, Quantitative methods, Self-efficacy, Social interaction, Social sciences, Special education

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Maartje Raijmakers, University of Amsterdam, Netherlands

Mathematical Skills as a Predictor of Interest in Mathematics in the First Grade

Keywords: At-risk students, Early childhood education, Motivation, Numeracy

Presenting Author:Riikka Mononen, University of Oslo, Norway; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Anita Lopez-Pedersen, University of Oslo, Norway; **Co-Author:**Hedda Wahl, University of Oslo, Norway

This study examined how Norwegian first graders' ($N = 297$) mathematical skills predicted their interest (i.e., enjoyment and participation) in mathematics-related activities. Students' mathematical skills (i.e., relational skills, counting skills and arithmetic) were measured during the school year, six months before their parents answered a questionnaire on child interest. After controlling for students' gender and parents' educational level, the results of hierarchical regression analyses showed that mathematical skills statistically significantly predicted both enjoyment and participation ($\beta = .358$ and $\beta = .307$, respectively). As early mathematical skills seem to enhance later interest in the domain, our findings emphasize the importance of early support for students with weak mathematical skills, before their difficulties start to interfere with motivation and interest.

Parental self-efficacy: Its components and how it relates to background characteristics of families

Keywords: Attitudes and beliefs, Early childhood education, Quantitative methods, Self-efficacy

Presenting Author:Juliane Schünke, Freie Universität Berlin, Germany; **Co-Author:**Elisa Oppermann, Freie Universität Berlin, Germany; **Co-Author:**Franziska Cohen, Freie Universität Berlin, Germany; **Co-Author:**Yvonne Anders, Freie Universität Berlin, Germany

Parental self-efficacy (PSE) is a assumed predictor of beneficial educational practices and often part of family intervention programs (Sanders, 1999; Sanders & Wooley, 2005). Many instruments do not adequately elaborate the PSE structure (Wittkowski et al., 2017). Mostly US-studies suggest that parents with a low income, migration background or less education report lower PSE (Ardelt & Eccles, 2001; Peacock-Chambers et al., 2017; Elder et al., 1995.). German evidence is needed for the development of local targeted intervention programs. Based on data of the study 'AQuaFam', which examines the intervention program 'Chancenreich', the PSE domains of healthcare, nutrition, physical activity, media competence, and general PSE were examined. Three models were compared: (1) one with four first-order factors, (2) one with a second-order factor which is the observed general PSE, (3) one second-order factor model with the second-factor being derived from the four domain-specific scales. The third model showed to have the best model fit (RMSEA=0.028, CFI=0.983). Mothers with a university degree reported less PSE in caring for sick children ($\beta = -0.17$, $p < 0.01$) but felt more self-effective in teaching their children media responsibility ($\beta = 0.19$, $p < 0.01$). Parents with a non-German family language felt less self-effective ($\beta = -0.29$, $p < 0.01$) in teaching children how to deal responsibly with media, as do families living in poverty ($\beta = -0.16$, $p < 0.05$). It may be concluded that intervention programs which aim at improving PSE need to be tailored to the needs of different groups of parents.

Tomorrows Gender Education - Challenges for future Gender Perspectives in Early Childhood Education

Keywords: Early childhood education, Ethnography, Qualitative methods, Social sciences

Presenting Author:Melanie Kubandt, University of Vechta, Germany

Thinking tomorrows Gender Education - Challenges for future Gender Perspectives in Early Childhood Education In gender debates in early childhood institutions in germany, it is possible to trace the tendency to pre-selected content. In discussions relating to elementary educational practice, for example, gender is subsumed under the label of individual and social differences as an essential difference dimension to be taken into account and emphasized in everyday pedagogical life. At the same time, gender, as a potential problem category for educational inequality, is rather focused critically on power, especially in the scientific context of early childhood education. Irrespective of whether gender is propagated as a productive characteristic of individuals or whether it is

problematic in the sense of inequality, the at first sight contrary orientations are based on the common question of how gender should be negotiated pedagogically rather than how gender is concretely negotiated in everyday pedagogical life. In this way, normative and prescriptive settlements on gender generally determine both the starting point and the goal of common positions in social work fields. On basis of ethnographic findings in a German early day care centre this specific tension is explained in connection with questions of future challenges for gender equality in child care facilities. Keywords: Gender -early childhood education – affirmation vs. power criticism -

Predictors of pro-social behaviors in children with disabilities in inclusive preschools

Keywords: Early childhood education, Peer interaction, Social interaction, Special education

Presenting Author:Vera Coelho, Porto University, FPCE, Portugal; **Co-Author:**Joana Cadima, University of Porto, Portugal; **Co-Author:**Catarina Grande, University of Porto, Portugal; **Co-Author:**Ana Isabel Mota e Costa Pinto, University of Porto - Portugal, Portugal

Positive social behaviors are of extreme importance for early development (e.g., Lane et al., 2015). Particularly in educational settings, social behaviors can be considered pivotal pieces for successful inclusion (e.g., Davis et al., 1996). However, children with disabilities often demonstrate lower levels of social competence (e.g., Guralnick et al., 2007) and thus, embedding opportunities for social interactions during instruction has been pointed as an effective way for increasing positive social behaviors of children with disabilities (McLaughlin et al., 2011). This study aims to examine whether more time spent in associative or cooperative interactions is associated with pro-social behaviors for children with disabilities. Participants were 54 preschool-aged children with disabilities, attending 42 inclusive classrooms. Children were assessed at two time points: Time 1 (spring), and Time 2 (one year later). At Time 1, proportion of time in associative and cooperative interactions was observed with the Child Observation in Preschool (Farran & Anthony, 2014) and pro-social behaviors were assessed using teacher reports of the Strengths and Difficulties Questionnaire (Goodman, 2005). Pro-social behaviors were again assessed at Time 2. Results show that, when controlling for children's initial pro-social behavior, age and gender, the proportion of time spent in cooperative activities was a positive predictor of pro-social behavior one year later ($B=19.08$, $SE=9.24$, $p=.046$, $R^2=.41$). Results expand previous findings (e.g., Farran et al., 2017) by underlining the importance of increasing the amount of cooperative interactions specifically for children with disabilities.

Session N 9

15 August 2019 10:15 - 11:45

Seminar Room - S13

Single Paper

Cognitive Science, Higher Education, Instructional Design, Learning and Instructional Technology

Cognitive Skills

Keywords: Assessment methods and tools, Cognitive skills, Competencies, Comprehension of text and graphics, Conceptual change, Educational Psychology, Game-based learning, Higher education, Learning disabilities, Primary education, Science education, Special education

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 04 - Higher Education, SIG 15 - Special Educational Needs, SIG 20 - Inquiry Learning

Chairperson: Lan Yang, The Education University of Hong Kong, Hong Kong

Seeing is not knowing. Detection errors do not explain poor performance in reading dental x-rays.

Keywords: Cognitive skills, Comprehension of text and graphics, Educational Psychology, Higher education

Presenting Author:Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Thérèse Eder, Leibniz-Institut für Wissensmedien (IWM), Germany; **Co-Author:**Juliane Richter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Fabian Huettig, Tübingen University Hospital Center for Dentistry, Oral Medicine, and Maxillofacial Surgery with Dental School, Tübingen, Germany, Germany; **Co-Author:**Constanze Keutel, Tübingen University Hospital Center for Dentistry, Oral Medicine, and Maxillofacial Surgery with Dental School, Tübingen, Germany, Germany

In medical education, many teaching approaches try to improve diagnostic performance of radiograph interpretation by instructing students to visually process all parts of the radiograph. This is to avoid detection errors caused by overlooking anomalies, which is linked to misguided bottom-up processes. In dental medicine, it is yet unclear whether diagnostic errors mainly result from misguided bottom-up or top-down processes with the latter resulting from a lack of knowledge about anomalies or their misinterpretation (recognition / decision-making errors). For designing effective image reading trainings, it is vital to know whether poor diagnostic performance is mainly caused by detection or recognition errors. Thus, we investigated the different types of errors with 78 students of dental medicine, who diagnosed radiographs while we recorded their eye movements. Results showed that students made significantly more top-down than bottom-up errors. Hence, the difficulties in diagnosing radiographs rather seem to result from a lack of knowledge about visual characteristics of anomalies than from visual coverage of the radiographs. Therefore, interventions should rather aim at avoiding top-down errors. For instance, students could be trained in characteristic visual features of anomalies, which should result in broader knowledge structures and thus more accurate top-down processes.

Preparing Primary School Students for Acquiring Proportional Reasoning Ability

Keywords: Cognitive skills, Conceptual change, Primary education, Science education

Presenting Author:Christian Thurn, ETH Zurich, Switzerland; **Co-Author:**Daniela Nussbaumer, University of Applied Sciences of Special Needs Education, Switzerland; **Co-Author:**Ralph Schumacher, ETH Zurich, Switzerland; **Co-Author:**Elsbeth Stern, ETH Zurich, Switzerland

Proportional reasoning enables scientific understanding of higher order ratios and is fundamental for understanding formal concepts. However, prior studies have shown that acquiring proportional reasoning is a demanding process. In the present study, we examined whether preparing students with inquiry-based instruction on a topic dealing with a proportional concept (density in the context of floating and sinking) supports the subsequent acquisition of proportional reasoning in the same context as well as in the less related context of speed. In a sample of 253 fifth-graders, we did not find significant differences between groups with and without prior knowledge about density, nor an interaction with the intervention context (density vs. speed). In a subgroup analysis, however, we found that among children with high general reasoning ability, the prior instruction on floating and sinking supported the acquisition of proportional reasoning. In the discussion, we emphasize the difficulty of achieving transfer effects from content knowledge to more general principles such as proportional reasoning.

Developing performance assessment for research on critical thinking

Keywords: Assessment methods and tools, Cognitive skills, Competencies, Higher education

Presenting Author:Heidi Hyttinen, University of Helsinki, Finland; **Co-Author:**Auli Toom, University of Helsinki, Finland

Performance assessment development is a three-phase process of (1) defining the construct of what is to be measured, (2) constructing the test items, task and scoring criteria, and (3) collecting evidence on what extent they tap into the intended construct (AERA et al. 2014; Mislevy 2018; Shavelson et al. 2018). In light of the three-phase process, the study presents the development of performance assessment, for research on critical thinking to be utilized in higher education and explores what kind of cognitive processes occurs while completing the assessment and how individual respondent characteristics such as prior knowledge are associated with these processes. Based on the preliminary evidence drawn from pilot project, the study concludes what kind of modifications are needed in order to develop this performance assessment further.

The challenge of usability testing with a population with Williams syndrome

Keywords: Cognitive skills, Game-based learning, Learning disabilities, Special education

Presenting Author:Sophie Bénard - Linh Quang, University of Geneva, France; **Co-Author:**Sandra Berney, University of Geneva, Switzerland; **Co-Author:**Kovijlka Barisnikov, University of Geneva, Switzerland; **Co-Author:**Julie Heiz, University of Geneva, Switzerland

Developing a serious game requires the evaluation of the prototype through usability testing. Usability testing reduces the risk of building an ineffective, inappropriate, or ill-adapted technology. Usability studies are different in children, as their reactions and definition of usability are quite different from that of adults. Literature offers different approaches to design and evaluate technologies for children. The issue arises as to how to acquire informative, pertinent, and usable usability data from a population with special needs. *Playing with Space*, a serious game we developed, aims at helping people with Williams syndrome

(WS) to train specific spatial abilities connected to graphic activity and the assimilation and appropriation of the respective tracing gestures. Indeed, the WS cognitive profile is marked by a significant dissociation between their preserved language skills and a significant deficit in their visuospatial abilities. The game offers players the chance to draw and train precise visuospatial shapes, with increasing complexity according to levels. To our knowledge, no effective usability testing method for special needs population is available. Our challenge here has been to select an appropriate game evaluation method for people with WS to obtain effective data that will enable an efficient and adapted update of the game. The multi-method used has brought to light certain limits and highlighted game strengths already present.

Session N 10

15 August 2019 10:15 - 11:45

Seminar Room - S03

Single Paper

Assessment and Evaluation, Higher Education

Psychometrics, Assessment Methods and Tools in Higher Education

Keywords: Assessment methods and tools, Educational Psychology, Higher education, Psychometrics, Science education, Secondary data analysis

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Judy M. Parr, University of Auckland, New Zealand

Developing and Validating a Short-form Assessment of Conscientiousness Competencies

Keywords: Assessment methods and tools, Educational Psychology, Higher education, Psychometrics

Presenting Author:Patrick Franzen, University of Luxembourg, Luxembourg; **Co-Author:**Lindie van der Westhuizen, University of Luxembourg, Luxembourg;

Co-Author:Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:**Antoine Fischbach, Luxembourg Centre for Educational Testing, Luxembourg;

Co-Author:Christoph Niepel, University of Luxembourg, Luxembourg

Of all the Big Five factors, conscientiousness has the strongest association with academic performance, and has been described as a *21st century skill* (Kim et al. 2016). MacCann et al. (2009) constructed a 59-item questionnaire for the comprehensive assessment of seven conscientiousness facets. However, such instruments are arguably too long for educational large-scale assessments, where testing time is often limited. Therefore, we used an exhaustive search algorithm for the development of a French and German short-form version of the original questionnaire presented by MacCann et al. (2009). Our validation sample consisted of a large and representative dataset comprising all 9th grade students in Luxembourg (N = 6,325). The algorithm was specified to select the best possible combination of four items for each of the seven lower order facets, by simultaneously considering goodness of fit, factor saturation statistics and scalar measurement invariance between the German and French language version. We found good fit statistics for all lower order facet scales (CFI >.95, RMSEA < 0.05), and acceptable to good factor saturation statistics for all (McDonalds $\omega > 0.7$) but one of these scales ($\omega = 0.616$). The result of our investigation is a psychometrically sound 28-item instrument for the assessment of seven conscientiousness competencies, which is measurement invariant between the German and French language version, and suitable for large-scale assessments in secondary and tertiary educational Settings.

Accounting for DIF in cross-country comparisons: A trade-off between for model fit and invariance

Keywords: Assessment methods and tools, Psychometrics, Science education, Secondary data analysis

Presenting Author:Yasmine El Masri, University of Oxford, United Kingdom; **Co-Author:**David Andrich, University of Western Australia, Australia

Differential item functioning (DIF) techniques are commonly used to detect test items that are not invariant across groups (e.g. language, gender, socioeconomic status) and may therefore constitute a source of bias in educational tests. Typically, DIF in items is accounted for *post hoc* by deleting DIF items, splitting them into unique items for each group or leaving them intact. Each of these options can be valid depending on the source of DIF. This paper argues that selecting one option over another inevitably involves a trade-off between model fit and invariance which in turn impacts on the validity of the assessments and conclusions drawn from them. An analysis of data of PISA 2006 science assessment from three countries (UK, France and Jordan) using the Rasch model and a two-way ANOVA of residuals to detect DIF items is used to illustrate the argument. The impact of deleting, splitting DIF items or leaving items intact on model fit and invariance will be discussed and an example of released PISA items where splitting DIF items is justified will be presented.

Session N 11

15 August 2019 10:15 - 11:45

Seminar Room - S10

Single Paper

Learning and Special Education

Special Educational Needs

Keywords: Arts, Attitudes and beliefs, Cognitive development, Collaborative Learning, Instructional design, Language (Foreign and second), Learning Technologies, Mixed-method research, Parental involvement in learning, Phenomenography, Primary education, Social interaction, Special education

Interest group: SIG 15 - Special Educational Needs

Chairperson: Jing Li, University of Cambridge, United Kingdom

Educational Collaboration in Complex Diagnostic Processes

Keywords: Collaborative Learning, Mixed-method research, Social interaction, Special education

Presenting Author:Mathias Mejeu, University of Bern, Switzerland

In this contribution, collaboration between educational experts is discussed with respect to processes in diagnostic decision making. Hereby, intra- and inter-professional collaborations are focused in view of their complexity and relevance. The analysis is formed by a variation of network-analysis having its origin in topology, formal logic and graph-theory. Therefore, a method was developed to detect, describe analyse typical pithy structures of the appropriate expert groups. The results of this study reveal that on the one hand diagnostic decision-making requires successful collaboration between various experts that might, due to the inclusive context, be submitted to role change. On the other hand, comparisons of diverse networks disclose that the structures of collaboration have to conform to the complexity of the relative state of decision-making.

Accessibility, usability and acceptability of digital textbooks for visually impaired students

Keywords: Attitudes and beliefs, Instructional design, Learning Technologies, Special education

Presenting Author:Laetitia Castillan, University of Toulouse, France; **Co-Author:**Julie Lemarié, University of Toulouse, France; **Co-Author:**Mustapha Mojahid, University of Toulouse, France

This study proposes to evaluate accessibility, usability and acceptability of digital textbooks for visually impaired students. User tests including 9 visually impaired and 10 sighted students were conducted. Each participant had to perform several learning tasks (1. annotation task, 2. interactive task, 3. navigation task) on a French 6th grade digital textbook. For each task, performance, time of realization and perceived mental effort were collected. Results show that at least one of the three measures are distorted for visually impaired students. Subjective ratings of satisfaction, self-efficacy, disorientation, investment and questions about strategy were also administered. If satisfaction and disorientation are equal between visually impaired and sighted students, self-efficacy decreases after using the digital text book for visually impaired students only. In sum, visually impaired students encounter more difficulties than sighted student when using digital textbook, what may be detrimental for learning.

Children's cognitive development in inclusive education. Longitudinal study of arts interventions

Keywords: Arts, Cognitive development, Language (Foreign and second), Special education

Presenting Author:Minna Törmänen, University of Applied Sciences of Special Needs Education: Zurich; University of Helsinki, Switzerland; **Co-Author:**Tanja Linnavalli, University of Helsinki, Finland; **Co-Author:**Marja-Leena Juntunen, University of the Arts Helsinki, Finland; **Co-Author:**Eeva Anttila, University of Arts, Helsinki, Finland, Finland; **Co-Author:**Mari Tervaniemi, University of Helsinki, Finland

The aim of this longitudinal intervention study was to examine the impacts of added music, movement, and music-and-movement interventions on children's (N=73) academic and cognitive skills in context of Finnish primary education during 3rd and 4th grades. The approach of study is inclusive, it is conducted in classroom context with children having Special Educational Needs, SEN (n=32) and different mother tongue than Finnish (n=24). *Cognitive and behavioral measurements.* In addition to academic measurements (mathematics, literacy skills), neurocognitive measurements (Modified Flanker Task, WISC-IV) were used. Brain activation was measured using EEG. A pre-tests-intervention-post-tests-design with waiting control group was used. Experimental group took part either music, movement or music-and-movement intervention, which were integrated in general education thrice-a-week, for 15 minutes. The control group did not receive other instruction. All groups had arts education according to curriculum. Interventions were taught by class teachers and they were easy to implement. Continuous supervision was offered for teachers during study period. Data collection was completed in summer 2018. First analyses showed that- at pre-tests, there were no differences between intervention and control groups in neurocognitive measurements.- SEN Status and Finnish as second language coincidence is high in our study population.- The treatment fidelity of interventions: Despite continuous supervision there was broad variation in intervention sessions between two years. Our study raises questions of transfer effects of interventions on academic and cognitive skills. In addition this study offers important information on children's cognitive development and on inclusive education more generally taken.

"That's what the mother said..." - Parents' experiences of co-operation with schools

Keywords: Parental involvement in learning, Phenomenography, Primary education, Special education

Presenting Author:Teija Koskela, University of Turku, Finland

In Finland every child in comprehensive school has a right to get support into schools everyday environment. According to national core curriculum this support should be planned together with parents. Furthermore all school practices should develop by guidelines of inclusive education. This paper describes how parents experience their position in process to build support for their children in schools compared with the ideal of inclusive education. The research question is how parents experience their relations with professionals when negotiating of support needed for their child. The intended purpose is to bring the quality of relations and interactions into focus based on parents' experiences and to create alternative approaches to represent co-operation between home and school. The aim is to have new information for pre-service teachers' education so, that they could use research based information in their future work.

Session N 12

15 August 2019 10:15 - 11:45

Seminar Room - S15

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Game-based Learning

Keywords: Cognitive skills, Educational technology, Game-based learning, Language (Foreign and second), Learning Technologies, Mathematics, Motivation, Out-of-school learning, Quasi-experimental research

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Christopher Anson, North Carolina State University, United States

The RAIDING project: Designing a mobile game to promote arithmetic fluency

Keywords: Cognitive skills, Game-based learning, Mathematics, Quasi-experimental research

Presenting Author:Tim Jay, Sheffield Hallam University, United Kingdom

The research team designed and evaluated a mobile game to promote arithmetic fluency among a group of children aged 7-8 years. The design of the game was based on principles drawn from research literature in mathematical cognition, game-based learning, and game design, and trains basic number knowledge within a motivating context. It tested an implication of theory of automatization of arithmetic facts that training of recognition of multiples of single-digit numbers should lead to greater fluency in solving multiplication and division problems. A quasiexperimental design was employed to test whether the game improves arithmetic fluency. Children played the game in their classrooms for 20 minutes per day for 2 weeks. Comparisons between pre- and post-tests showed that the game-playing group outperformed controls with a medium to large effect size (> 0.6). The results suggest an improvement in arithmetic fluency equivalent to around 7 months' progress and provide rare empirical evidence supporting transfer of game-based training to a pencil and-paper test. The findings help to confirm a connectionist theory of arithmetic skill, showing that improved recognition of multiples contributes to multiplication and division skill.

An experimental study on gamifying vocabulary learning with a mobile language-learning app

Keywords: Educational technology, Game-based learning, Language (Foreign and second), Learning Technologies

Presenting Author:Muhterem Dindar, University of Oulu, Finland; **Co-Author:**Lei Ren, University of Oulu, Finland; **Co-Author:**Hanna Jarvenoja, University of Oulu, Finland

The advent of mobile devices (e.g. smartphones, tablets) and proliferation of mobile language learning apps (MLLA) offer various opportunities for individuals to learn foreign languages. However, little is published on the effective design of MLLAs. This study investigated the effects of gamified cooperation and gamified competition on task completion, motivation, interpersonal closeness, and learning achievement in a mobile English language learning app. Our findings showed that cooperation yielded higher interpersonal closeness whereas competition produced higher learning achievement. No difference was observed between cooperation and competition in terms of task completion or task enjoyment. The current findings indicate that both cooperation and competition can be effective in engaging learners with the learning in MLLAs. The study calls for future research to investigate the long-term effects of cooperation and competition in mobile language-learning.

The Effect of Game-based Computational Thinking Workshops on Students' Computational Thinking Skills

Keywords: Game-based learning, Learning Technologies, Motivation, Out-of-school learning

Presenting Author:Nur Akkus Cakir, Middle East Technical University, Turkey; **Co-Author:**Murat Perit Cakir, Middle East Technical University, Turkey; **Co-Author:**Arianna Gaas, Drexel University, United States; **Co-Author:**Frank Lee, Drexel University, United States

This study explores the potential benefits of game design workshops to harness students' enthusiasm for computer science. The workshop aimed to engage participants in age-appropriate activities that focus on computational thinking skills through the lens of creating their own game. During the workshop participants explored computational thinking in the context of both paper-based and computerized game design activities. A web-based game design interface that allows students to develop and play a game as simulated on a real-world skyscraper was implemented to support the core activities in the workshop. Preliminary analysis of pre/post-surveys and pre/post-tests suggest that the workshop experience helped students develop their computational thinking skills and informed their perception of computing as a profession.

Session N 13

15 August 2019 10:15 - 11:45

Seminar Room - S05

Instructional Design

Keywords: Computer-supported collaborative learning, Educational Psychology, Experimental studies, Higher education, Instructional design, Integrated learning, Mathematics, Problem solving, Quantitative methods, Second language acquisition, Secondary education, Self-efficacy

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Kerstin Baeuerlein, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Effects of Example and Problem Solving Sequence Length on Motivation and Learning

Keywords: Higher education, Instructional design, Problem solving, Self-efficacy

Presenting Author: Milou van Harsel, Avans University of Applied Sciences / Utrecht University, Netherlands; **Co-Author:** Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Peter Verkoeijen, Erasmus University Rotterdam, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands

It is well established that, for novice learners, studying examples is a more effective and efficient instructional strategy than practice problem solving. There are, however, still open questions on how and when examples should ideally be introduced to optimize students' motivation and learning outcomes. Prior research has compared effects on learning of 1) examples only (EEEE), 2) example-problem pairs (EPEP), 3) problem-example pairs (PEPE), and 4) problems only (PPPP), in short learning phases and found [EEEE=EPEP]>[PEPE=PPPP]. In Experiment 1 ($N = 128$), we aimed to replicate and explain those findings by adding measures of motivational aspects of learning (i.e., self-efficacy, perceived competence, and topic interest). In addition, because effects on motivation and learning might depend on sequence length, Experiment 2 ($N = 106$) used the same design but a longer learning phase with eight tasks (i.e., EEEEEEEE/EPEPEPEP/PEPEPEPE/PPPPPPPP). Results from both experiments revealed that participants in the example conditions (i.e., EE, EP, and PE) attained higher posttest performance with lower effort investment in the learning and posttest phases than the problem solving only condition. In addition, the example conditions scored significantly higher on motivational measures (i.e., self-efficacy and perceived competence) than the problem solving only condition. However, neither experiment revealed differences between the EP and PE conditions on learning and motivation, despite an initial difference in self-efficacy and perceived competence after the first task. These results suggest that studying examples (only) is more effective, efficient, and more motivating than practice problem solving only, with both short and longer task sequences.

Learning by tracing on computer screens

Keywords: Educational Psychology, Experimental studies, Instructional design, Quantitative methods

Presenting Author: Paul Ginns, The University of Sydney, Australia; **Co-Author:** Fang-Tzu Agnes Hu, The University of Sydney, Australia; **Co-Author:** Janette Bobis, The University of Sydney, Australia

Gestures using the index finger to point and trace have been found across a variety of studies to benefit learning. Cognitive load theory has been used to explain these results, but it is currently unclear whether tracing acts to reduce intrinsic cognitive load, extraneous cognitive load, or both. The experiment presented here used multi-item measures of cognitive load to test both hypotheses, and in addition, intrinsic motivation hypotheses, when students learnt from PowerPoint-based materials. Participants ($n = 106$ Australian Year 5-7 students) who traced out elements of worked examples on parallel lines solved more transfer questions on a subsequent test, but no reliable differences between conditions were found on the post-lesson self-reports of cognitive load or intrinsic motivation. The results of the experiment add to the evidence base on tracing to learn by demonstrating such instructions can be effectively incorporated into lessons delivered on a typical computer screen, but questions remain about the processes underpinning effects on learning.

Scripting collaborative writing within a multi-shared visual workspace: a quasi-experimental study

Keywords: Computer-supported collaborative learning, Higher education, Instructional design, Second language acquisition

Presenting Author: Annelies Raes, KU Leuven, Belgium; **Co-Author:** Maribel Montero Perez, KU LEUVEN, ITEC, Belgium

Numerous studies have addressed collaborative writing processes, both in native language and foreign language (L2) learning contexts. So far, however, it remains unclear what the role of the following two collaboration support tools is in a collaborative writing activity: a collaboration script which includes specific role assignment and a multi-shared visual workspace. Therefore, this study investigates: (1) the impact of a script on participants' group process and their writing performance; (2) the role of a multi-shared visual workspace in collaborative writing and its effect on participants' attention allocation during writing. In order to address these questions, 76 students of Economics enrolled in a L2 French course were randomly assigned to a group of maximum 6 students. The groups who were tested during the first week of the experiment were part of the control group. The other half received a collaboration script (scripting group). All students worked in the same workspace and completed a French vocabulary knowledge test which gives an estimate of their French proficiency. Both quantitative (writing performance and rating of texts), qualitative data (group process and self-evaluation reports), as well as video recordings of 4 groups were used in order to address the research questions. Results indicate that the groups performed equally well on grammatical and structural aspects of the text but the scripting group outperformed the control group on measures related to lexis. No significant differences were found for self-reported quality of collaboration. However, video analyses of attention allocation patterns might further clarify collaborative writing processes.

Developing creative thinking in mathematics and its impact on learning

Keywords: Instructional design, Integrated learning, Mathematics, Secondary education

Presenting Author: Victoria Guentulle, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Sebastián Rivera, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Kevin Steinsapir, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Paulina Araya, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Benjamín Benavides, Pontificia Universidad Católica de Chile, Chile

Creativity is a skill important not only in problem solving, but also in everyday life. Creative people find ways of looking at problems that others cannot see. However, conventional tests, traditional lecture-style classes, overloaded curricula and a lack of creativity teaching skills, are some of the main barriers preventing creative learning. The aim of this work is to study how learning can be improved in mathematics by developing creativity through analogical transfer. Analogical transfer is one method that uses the idea of analogy by taking objects, ideas or concepts from a given domain and comparing it with another in order to generate new ideas. A study with 42, 12th grade students was conducted in a school in Chile, with low-performing students with low socioeconomic status. The results show that creative activities can be included in the classroom without having to alter the existing curricula, and that these activities not only foster creative thinking among the students, but also improve their understanding of the content. These findings are even more relevant when considering that the methodology was applied in a low-income school, one of the many schools where learning and creativity appear to be unattainable goals.

Session N 14

15 August 2019 10:15 - 11:45

Seminar Room - S16

Single Paper

Motivational, Social and Affective Processes

At-Risk Students

Keywords: At-risk students, Attitudes and beliefs, Educational Psychology, Emotion and affect, Higher education, Motivation, Motivation and emotion, Neuroscience, Qualitative methods, Social development

Interest group: SIG 08 - Motivation and Emotion, SIG 22 - Neuroscience and Education

Chairperson: Guillermo Solano-Flores, Stanford University, United States

Struggling with academic career choices: relations with neural correlates of self-concept

Keywords: At-risk students, Attitudes and beliefs, Higher education, Neuroscience

Presenting Author:Laura van der Aar, Leiden University, Netherlands; **Co-Author:**Eveline Crone, Leiden University, Netherlands; **Co-Author:**Sabine Peters, Universiteit of Leiden, Netherlands

An important challenge for adolescents is to make future-oriented academic choices that match their identity, such as choosing a major in higher education. However, educational decision-making is a complex process and individual factors such as how adolescents think about – and evaluate themselves could play an important role in this decision-making process. In this study (N=84), we combined behavioral and neural correlates of multiple self-concept measures to examine what characterizes adolescents who experience difficulties with making future-oriented academic choices. We included 38 adolescents (16 – 24y, $M=18.7y$) who were starting a training program named “the Gap-Year program”. This program is developed for adolescents who have dropped out of higher education and focuses on increasing self-awareness and self-esteem. We compared these adolescents prior to the start of the training with a group of 46 peers (17 – 21y, $M=19.4y$) who reported to have successfully chosen a major. Behavioral results showed that participants starting the Gap-Year program scored lower on general self-esteem and self-concept clarity, compared to adolescents who did not experience difficulties with academic choices. On a neural level, thinking about self was associated with more activity in the medial PFC. This mPFC activity was stronger for individuals with higher self-esteem and differed between the groups with and without problems with academic choices, with reduced activity for the Gap-Year group. Together, these results suggest that healthy levels of self-esteem are an important condition for the ability to make future-oriented academic choices.

Students’ perceptions and experiences of LGBTQ+ inclusion within UK secondary schools

Keywords: At-risk students, Emotion and affect, Qualitative methods, Social development

Presenting Author:Charlotte Allen, University of Cambridge, United Kingdom

This paper explores students’ perceptions and experiences of LGBTQ+ (lesbian, gay, bisexual, transgender and other sexual and gender minority) inclusion within UK secondary schools. Qualitative analysis of questionnaire responses and transcribed interviews voiced the ways in which students and teachers feel that LGBTQ+ individuals are currently included and excluded within the school curriculum and culture, and explored perceived impacts upon students’ wellbeing and resilience. Findings also emerged in relation to the complexity of inclusion; school practices that some students see as essential in creating safety and support, others view as contributing to the ‘othering’ of LGBTQ+ individuals. It is hoped that the findings will impact upon school policies surrounding LGBTQ+ inclusion and curriculum, creating a safe learning environment for all students and enhancing wellbeing.

Subject-specific task value profiles and well-being among students in Germany and Finland

Keywords: At-risk students, Educational Psychology, Motivation, Motivation and emotion

Presenting Author:Heta Tuominen, University of Helsinki, Finland; **Co-Author:**Hanna Gaspard, University of Tübingen, Germany; **Co-Author:**Yi Jiang, East China Normal University, China; **Co-Author:**Markku Niemivirta, University of Oslo, Norway

Students’ value beliefs have been shown to be crucial predictors of academic outcomes (e.g., performance, choices), but less is known about how they relate to another important educational outcome, well-being. Following a person-oriented approach, the aim was to investigate what kinds of math- and English-specific task value profiles can be identified among students in Germany and Finland, and how students with different profiles differ in well-being (i.e., perfectionism and school-related exhaustion). All four value components (i.e., intrinsic, attainment, utility, cost) and multiple facets of them were considered. A total of 483 students from academic track schools in Germany and 433 students from upper secondary schools in Finland participated in the study. Confirmatory factor analyses were conducted to test the separability of value and cost facets, latent profile analyses were used for identifying the profiles, and ANOVAs were conducted to examine group differences. Three similar profiles were identified in both countries: high positive value, low cost (37%/28%), English-motivated, high math cost (30%/20%), and moderate math, low English (22%/29%) and, also, a low positive value, high cost (11%) profile was identified in Germany and a high positive value, high cost (23%) profile in Finland. In general, students displaying high positive values scored relatively high on setting high standards, while students characterized by high cost were most likely to display exhaustion and discrepancy. Our study extends previous research by considering the role value beliefs and perceived cost play in well-being. The domain-general versus domain-specificity of students’ task value profiles will be discussed.

Session N 15

15 August 2019 10:15 - 11:45

Seminar Room - S14

Single Paper

Higher Education

Qualitative Methods in Higher Education

Keywords: Case studies, Educational attainment, Educational Psychology, Higher education, Interdisciplinary, Motivation and emotion, Qualitative methods, Student learning

Interest group: SIG 04 - Higher Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Maria Tsapali, University of Cambridge, United Kingdom

University in the rear view mirror: Psychological needs in alumnis’ pleasant and unpleasant memories

Keywords: Educational Psychology, Higher education, Motivation and emotion, Qualitative methods

Presenting Author:Stefan Janke, University of Mannheim, Germany; **Co-Author:**Melanie Alsmeyer, Universität Mannheim, Germany; **Co-Author:**Miriam Neißner, Universität Mannheim, Germany

Prior research based on Self-Determination Theory suggests that the satisfaction or frustration of university students’ basic psychological needs for autonomy, competence and relatedness affects their well-being. However, most of this research is limited to quantitative approaches, which makes it difficult to rule out that some of the obtained relationships represent spurious correlations founded in assimilation effects (i.e., evaluation of well-being in quantitative questionnaires could be influenced by prior reflections on need satisfaction). There is also little research on long-term well-being indicated by positive nostalgia and pleasant memories regarding ones’ time at university. We aimed to close this research gap by conducting a qualitative study within 263 bachelor alumni of a German university. We analyzed the data of two open questions, which assessed pleasant and unpleasant memories of the participating alumni regarding their time at university. Two raters applied a sequential approach to code the content of the obtained memories into meaningful categories. The raters evaluated whether the reported memories obtained any information on basic psychological needs and developed additional categories that were suitable to categorize additional information. We found that 62.5% of the pleasant memories and 46.9% of the unpleasant memories referenced basic psychological needs. Moreover, relatedness was one of the two most frequently mentioned characteristics of pleasant memories and (a lack of) autonomy was the most frequently mentioned characteristic of unpleasant memories. Overall, this result pattern shows that students’ basic psychological needs are an important foundation of longtime satisfaction with ones’ studies at university.

Impact of short-term international experiences on students’ academic engagement: One year later

Keywords: Educational attainment, Higher education, Qualitative methods, Student learning

Presenting Author:Yusuke Sakurai, Ochanomizu University, Japan

The short-term international course (SIC) is the growing major vehicle for building students’ competence and providing high-impact global opportunities for university students’ academic engagement. However, the long-term impact of SICs on students’ academic engagement has been underexplored. Drawing the student engagement framework, this study investigated how SIC experiences impacted a long-term university student academic engagement. This study used

semi-structured interviews to collect data from 22 liberal arts students following the completion of the SIC courses and about 12 months after the courses. The analysis elicited students' perceptions of their university studies and their SIC experiences. The results provided three major contributions, regarding SIC experiences and students' academic engagement after one year: 1) *interpersonal relationship*, 2) *foreign language use*, and 3) *subject-specific matter*. The SIC experiences considerably developed students' *interpersonal relationships* and influenced their academic competence and motivation since they learned how other students in different learning contexts developed themselves passionately. The intensive *foreign language use* also had longitudinal impacts on students' academic motivation, influencing their decisions to enroll in a long-term study abroad program. Learning new *subject-specific matter* in SICs influenced students' study plans and course enrolment selection. The findings demonstrated that SIC experiences had long-term impacts on students' academic engagement, which was simultaneously associated with their choice decision of long-term academic program.

Intended and Realised Interdisciplinarity: Experiences from the University of Copenhagen

Keywords: Case studies, Higher education, Interdisciplinary, Qualitative methods

Presenting Author: Katrine Lindvig, University of Copenhagen, Denmark

The ability to work and collaborate across disciplinary boundaries has been identified as a key skill for the future, and there is an increasing interest in the production of graduates, who can move between disciplines. Meanwhile, there is a lack of knowledge on how to actually plan and develop coherent interdisciplinary activities for different purposes and there is a need to identify ways of aligning the intended level of interdisciplinarity in the activities, with the realised level.

This presentation draws on findings from a two-year ethnographic field study at the University of Copenhagen, and focuses on different ways of planning and structuring interdisciplinary education activities, with a strong emphasis on the discrepancies between intended and realised levels of interdisciplinarity.

While the teaching activities reported in literature and observed in the field study were very diverse and combined a range of different disciplines, there were similarities in how the activities were structured. As a way to present these similarities, we employ three metaphors. The three metaphors do not constitute a taxonomy of increasing levels of interdisciplinary integration, neither are they hierarchical in terms of presenting 'more' or 'less' interdisciplinarity. In the presentation, the three metaphors are applied in order to discuss different ways of planning interdisciplinary activities. Concrete examples of the three metaphors will be provided from the empirical data. Finally, the participants are invited to discuss if, and how, the three metaphors reflect their own teaching.

Session N 16

15 August 2019 10:15 - 11:45

Lecture Hall - H11

Single Paper

Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Assessment methods and tools, Case studies, Competencies, Cultural diversity in school, Higher education, History, In-service teacher education, Philosophy, Pre-service teacher education, Quantitative methods, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Ann Dowker, University of Oxford, United Kingdom

Teacher learning in 'multiblaba' schools: Perspectives to move beyond arbitrariness

Keywords: Case studies, Cultural diversity in school, In-service teacher education, Teacher professional development

Presenting Author: Nikolett Szelei, University of Lisbon, Portugal

This presentation describes context-based professional development (PD) for cultural and linguistic diversity in a Portuguese case study, and discusses its relations to whole-school transformation. Several existing opportunities for teacher learning were detected such as formal, starting small collaborations and teachers' self-directed informal learning activities. The teachers in the study clearly felt the importance of PD and showed willingness and interest to learn. Yet, from a whole-school perspective, a rather arbitrary character of a PD system was found, both in terms of content on cultural and linguistic diversity and forms of learning. Conflicting agendas, scattered teacher collaboration and commitment, and little student and community involvement in planned PD were detected. There also seemed to be a mismatch between current PD and teachers' needs and circumstances; they wished for more specific information and pedagogical solutions, more collaboration and more organisational support in PD. Applying a critical multicultural perspective, it is discussed how PD that engages with student and community voices, fosters teacher collaboration and approaches cultural diversity from a social justice perspective could facilitate moving beyond arbitrary PD. Ultimately, establishing a system that includes and empowers both teachers and students seems to be necessary in transformation.

Searching for the missing link in coherence

Keywords: Higher education, Pre-service teacher education, Quantitative methods, Teaching approaches

Presenting Author: Esther Canrinus, University of Agder, Norway; **Co-Author:** Kirsti Klette, University of Oslo, Norway; **Co-Author:** Karen Hamerness, American Museum of Natural History, United States

To tackle the continuous criticism of a lack of coherence and being disconnected from practice, teacher education programs have started to focus on the study and practice of teaching on campus. Yet, without theory, candidates may develop a technical view of teaching, lacking the understanding of the theoretical rationale behind the practices. Additionally, learning about research methods is a part of many teacher education programs as it helps candidates to become reflective and creative teachers who are able to learn systematically about their practice. Against this background, we investigate how the studying and practicing of teaching and attention to theory and research within campus courses influence teacher candidates' perception of coherence in their teacher education program. Data from 270 candidates from Norway, Sweden and the US (California) were analyzed. Stepwise regression analyses show that, after controlling for the program candidates belong to, the study and practice of teaching and the opportunity to learn about theory contribute to explaining differences in perceptions of coherence between courses and opportunities to connect the various parts of the program. However, it seems that other variables come into play when candidates are asked about coherence between field experiences and campus courses. We furthermore find that learning about, reading, discussing, or analyzing research methods within methods courses is not a significant predictor of candidates' perception of coherence. This finding seems to contrast the call for more attention to research methods in teacher education.

FALKO-Geschichte: A PCK/CK-test of teacher competences in history education

Keywords: Assessment methods and tools, Competencies, History, Teacher professional development

Presenting Author: Jochen Kirchoff, Universität Erfurt, Germany; **Co-Author:** Stefan Krauss, University of Regensburg, Germany

Can domain-specific teacher competences in history education be assessed objectively, reliably and validly? This paper presents the conceptualization, operationalization and validation of a new paper-pencil-test instrument. It assesses the domain-specific professional knowledge base of experienced German teachers in the subject field of history at secondary level. Theoretically the test-instrument *FALKO-Geschichte* is based on Shulman's taxonomy of teachers' professional knowledge and the model of the COACTIV study. In 2019, the finalised test *FALKO-Geschichte* will be administered under comparable and controlled conditions to convenience quota samples of experienced teachers of history at secondary level. The proposed paper will present descriptive data of the samples, derived from the two pilot studies as well as from the validation study. Inter-rater-reliability measures, scale reliability and correlations between test scores and individual characteristics will be reported. *FALKO-Geschichte* is a hitherto unique test instrument, since comparable domain-specific test instruments focus on lower levels of expertise or narrow down only on history teacher's CK or PCK.

A Critical Stance Towards Pedagogical Content Knowledge

Keywords: Philosophy, Teacher professional development, Teaching approaches, Teaching/instruction

Presenting Author: Thorsten Scheiner, Australian Catholic University, Australia

The focus of this presentation is on the construct of pedagogical content knowledge, giving an account of its theoretical underpinnings, taking a critical stance towards its underlying assumptions, and outlining potential contradictions with more recent understandings of students' knowing and learning. The idea of transforming subject matter for teaching offered by Shulman works well for simplified understandings of learning and teaching (where the teacher deconstructs disciplinary knowledge while the student constructs meaning); however, falls short with somewhat dynamic (where knowledge is considered more as a process than as an object) and complex views on knowing and learning (as it is often non-linear or unpredictable).

Session N 17

15 August 2019 10:15 - 11:45

Seminar Room - S02

Single Paper

Lifelong Learning, Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Professional Development

Keywords: Achievement, Attitudes and beliefs, Educational policy, Experimental studies, Model-based reasoning, Motivation, Peer interaction, Pre-service teacher education, Primary education, Qualitative methods, Science education, Teacher professional development, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education

Chairperson: Airi Hakkarainen, University of Eastern Finland, Finland

Teacher education and teachers' valuations of theory and practice oriented professional development

Keywords: Motivation, Pre-service teacher education, Primary education, Teacher professional development

Presenting Author:Folke Glastra, Leiden University, Netherlands; **Co-Author:**Cornelis de Brabander, Leiden University, Netherlands; **Co-Author:**Kim Stroet, Leiden University, Netherlands

In a mixed method investigation (108 surveys and 30 interviews), the role of academic and non-academic teacher education in preferences and motivations for practice and theory oriented professional development of primary teachers in the Netherlands was studied. In prior research, we found evidence of primary teachers' preference for strongly practice oriented rather than theory oriented professional development. Making use of concepts and measurement instruments drawn from De Brabander's and Martens' (2014) Unified Model of Task specific Motivation, we found that differences in academic and non-academic teacher education backgrounds influence theory oriented professional development preferences – more preference in academic, less in non-academic teachers -, but not practice oriented professional development preferences. However, many of the efficiency arguments in favour of directly applicable practice oriented professional development, and against perceived higher costs to make theory oriented professional development applicable, point at the overall influence of work pressures frequently referred to in both teacher groups. It is concluded, that changes in teacher education may stimulate a more positive reception of theory oriented professional development among teachers, but cannot be expected to outweigh the effects of current work pressures, and the efficiency habitus that it has produced in primary teachers.

Teaching Examples and its Impact on Instruction Planning of Pre-Service Physical Education Teachers

Keywords: Experimental studies, Model-based reasoning, Teacher professional development, Teaching/instruction

Presenting Author:Tim Heensoth, Universität Hamburg, Germany

Reflections on teaching examples are assumed to have positive effects on the professional development of pre-service teachers. However, effects on measures that are close to professional practice – e.g. instruction planning – are relatively unknown. Beyond, it is unclear if good or problematic teaching examples better foster professional development. The current project comprises two experiments with pre-intervention-post-design: We randomly assigned 83 (experiment 1) and 81 (experiment 2) undergraduate pre-service physical education teachers to different experimental conditions; they either reflected on good teaching or problematic teaching examples or they compared both types of examples (experiment 1) or they either compared problematic and good teaching examples or they compared only good teaching examples (experiment 2) We choose "planning teacher adapted self-controlled learning" as our depended variable. The results indicate that reflections on teaching examples lead to a better planning of physical education. We found that the comparison of examples supported their instruction planning more than reflecting good or problematic teaching examples only (experiment 1). However, those who compared only good teaching examples outperformed those who compared problematic and good teaching examples (experiment 2). In addition, comparing examples changed the pre-service teachers' beliefs. We finally discuss the results with regard to implications on (physical education) teacher education.

Teachers' view on formative assessment – impact of experimental teaching with peer-assessment

Keywords: Achievement, Peer interaction, Science education, Teacher professional development

Presenting Author:Iva Stuchlikova, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Iva Zlabkova, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Alena Hospesova, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Jan Petr, University of South Bohemia Ceske Budejovice, Czech Republic; **Co-Author:**Lukas Rokos, University of South Bohemia Ceske Budejovice, Czech Republic

Teachers' perspective on formative assessment is quite essential for its implementation in everyday classroom practices (Heritage, 2007). Even if teachers appreciate the benefits of specific forms of assessment they may still be hesitating to implement them, due to doubts about its usefulness and applicability in their own teaching. Such a dilemma may be overcome by participating in research whilst developing experimental teaching units, and enacting and reflecting on this new experience together with a research team. We wonder to what extent such a collaboration can influence science teachers' perspective on formative assessment and thus also their readiness to implement the new forms of assessment in their teaching. A group of 18 science teachers participated in this study. Their perspective during implementation of experimental teaching with embedded formative peer-assessment instances was investigated. Teachers' views were captured by means of questionnaires and group discussions. These views were gathered at different stages of the project (before teaching the experimental units, after having taught and reflected on the experience of teaching those units and 20 months after that). Data was analysed by thematic analysis, which pointed to the factors influencing the development of science teachers' understanding and implementation of formative assessment in inquiry-based lessons

An ideological perspective of School principals' perceptions as educational leaders

Keywords: Attitudes and beliefs, Educational policy, Qualitative methods, Teacher professional development

Presenting Author:Roni Reingold, Achva Academic College / Hemdat Hadarom College of Education, Israel; **Co-Author:**Keren Dery, Achva Academic College, Israel

This qualitative research describes the perceptions and actions of school principals in the context of their role in leading the teaching staff's professional development, a responsibility added by the New Horizon reform in Israel. Their perceptions were examined in reference to three educational ideologies: socialization, acculturation and individuation. Data analysis of Semi structured interviews conducted with 20 principals of elementary and junior high secular Jewish schools revealed a contradiction between the educational ideology that emerged in the context of the overall educational endeavor and the ideology referred to in the context of their role in teachers' professional development. Implications of this contradiction are discussed.

Session N 18

15 August 2019 10:15 - 11:45

Seminar Room - S04

Single Paper

Motivational, Social and Affective Processes

Mathematics and Motivation and Emotion

Keywords: Assessment methods and tools, Attitudes and beliefs, Educational Psychology, Learning disabilities, Mathematics, Motivation and emotion,

Secondary education, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Lies Declercq, KU LEUVEN, Belgium

The “Perfect” Lens: Effects of Perfectionism on Early Adolescents’ Math Self-Efficacy Development

Keywords: Educational Psychology, Mathematics, Motivation and emotion, Self-efficacy

Presenting Author:Xiao-Yin Chen, University of Kentucky, United States; **Co-Author:**Calah Ford, University of Kentucky, United States; **Co-Author:**Ellen Usher, University of Kentucky, United States; **Co-Author:**Veronica Scott, University of Kentucky, United States

Predispositions may influence the way students’ confidence (i.e., self-efficacy) develops. One such predisposition, perfectionism, has been associated with increased stress and anxiety but also with better performance and higher self-efficacy. This study focused on the relationship between two facets of perfectionism (i.e., self-oriented, socially-prescribed), and students’ ($N = 1,781$; Grades 4-8) self-efficacy development, examining whether the sources of self-efficacy (mastery experiences, vicarious experiences, social persuasions, physiological and affective states) might be perceived differently by perfectionistic individuals. The purpose of this study was to investigate how self-oriented and socially-prescribed perfectionism are related to adolescents’ math self-efficacy and whether the relationship between perfectionism and self-efficacy might be mediated by the sources of self-efficacy listed above. A direct relationship from self-oriented (positive) and socially-prescribed (negative) perfectionism to math self-efficacy was established. A mediation model through the four sources of self-efficacy revealed that self-oriented perfectionism was significantly, positively related to mastery experience, vicarious experience, and social persuasion, which fully mediated its relationship to math self-efficacy. Socially-oriented perfectionism was significantly and negatively related to mastery and vicarious experiences and positively to physiological/affective states. The negative effect of socially-prescribed perfectionism on math self-efficacy was partly mediated through these sources. Findings support the theory that psychological predispositions like perfectionism may influence the way in which students interpret information from the four sources of self-efficacy. Implications for practice and future studies are discussed.

Validation of the State- and Trait-Math Anxiety-Model

Keywords: Assessment methods and tools, Attitudes and beliefs, Mathematics, Motivation and emotion

Presenting Author:Lars Orbach, Universität Duisburg-Essen, Germany; **Co-Author:**Moritz Herzog, University of Duisburg-Essen, Germany; **Co-Author:**Annemarie Fritz-Stratmann, University of Duisburg-Essen, Germany

For several years the research status regarding the relationship between math anxiety (MA) and math performance in young children is inconsistent. One reason for this can be seen in varying definitions and different operationalizations of MA (Sorvo et al., 2017). One basic model to classify anxiety reactions is the psychological state-trait anxiety model. It includes the cognitive, affective and physiological levels of anxiety reactions (Spielberger, 1972). Even though the model was rarely used in research on MA so far, it can be adapted for the current definitions of MA. The measures currently used in research differ in relation to MA concepts by operationalising trait-MA and/or state-MA (Orbach, Herzog, & Fritz, 2019). The present research aims to validate the state- and trait-MA-model in young children. For this purpose, questionnaires on the basis of the psychological state-trait-anxiety model and instruments for assessing math achievement and trait-components of general, social and test anxiety were used in two studies with 1179 and 725 students from grades 4 and 5. To answer the research questions PCA's were conducted on state-MA and different anxiety trait-items for both samples. Two distinct factors of state- and trait-MA-items can be identified. The examinations yielded empirical justification that state-MA can be distinguished from MA, social and test anxiety traits, whereas general anxiety traits seem to be closely related to state-MA. Both studies show indications that performance-inhibiting effects are caused by state-MA. In general, the findings emphasise the benefit of the state-trait-anxiety model.

The Relation Between Working Memory and Inhibitory Control in Math Anxiety: A Meta-Analyses Study

Keywords: Attitudes and beliefs, Learning disabilities, Mathematics, Motivation and emotion

Presenting Author:Patrícia Freitas, Multidisciplinary Institute of Health, Brazil

This work aims to summarize the evidence for math anxiety associated with deficits in working memory and inhibitory control. The study includes 25 papers that investigated the association between math anxiety with work memory and inhibitory control published from 2008 to 2018. This meta-analysis demonstrated that measures of math anxiety are related to poorer performance on tests of working memory capacity. Moderate correlations were found between math anxiety with work memory. The studies compare the cognitive profile comparing groups with high and low mathematical anxiety. For this comparison, the results showed that the group with high level of anxiety had lower scores for working memory, inhibitory control. The worst performance in math was also found for the group individuals with high levels of math anxiety. The results found are convergent for a worse performance of the executive functions (working memory and inhibitory control) for groups with a high level of mathematical anxiety.

Profiles in mathematics achievement: Lessons from Japanese secondary schools

Keywords: Mathematics, Motivation and emotion, Secondary education, Self-efficacy

Presenting Author:Quint Oga-Baldwin, Waseda University, Japan; **Co-Author:**Luke Fryer, University of Hong Kong, Hong Kong

Domain specific motives can help explain why certain students achieve at a high level. Japanese students consistently show high achievement on international comparisons of mathematics ability, and thus their motives for the subject are a topic of interest. In this study, we used latent profile analysis (LPA) to explore population subgroups in a representative sample of Japanese learners ($n = 830$). Results indicated six profiles: low quantity motivation, moderate motivation, moderate quality motivation, high quantity motivation, good quality motivation, and poor quality motivation. Adaptive profiles (moderate quality, high quantity, good quality) represented roughly 40% of the sample, and had higher than normal achievement. These profiles were related with supportive instruction and low external control from teachers. Results confirm the importance of a supportive environment for improving students’ motivation. Further, a large proportion of Japanese students appear to hold adaptive motivational profiles, providing some explanation for their consistent high achievement results.

Session O 1

15 August 2019 12:00 - 13:30

Seminar Room - S12

Single Paper

Assessment and Evaluation, Cognitive Science, Motivational, Social and Affective Processes, Teaching and Teacher Education

Assessment Methods and Tools

Keywords: Achievement, Assessment methods and tools, Cognitive skills, Competencies, Higher education, Intelligence, Language (Foreign and second), Lifelong learning, Mathematics, Motivation, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 12 - Writing

Chairperson: Yusuke Sakurai, Japan

Presentation of a short writing apprehension measure and its relationship with writing

Keywords: Assessment methods and tools, Cognitive skills, Motivation, Writing/Literacy

Presenting Author:Teresa Limpo, University of Porto, Portugal

The term writing apprehension refers to “a person’s general tendencies to approach or avoid situations perceived to demand writing accompanied by some amount of evaluation” (Daly, 1978, p. 327). Although this term was coined four decades ago and prior research suggested its importance for writing, there is still an absence of short measures to validly and reliably assess writing apprehension; as well as a paucity of research examining its role in undergraduates writing. In order to fill in these gaps, I conducted two studies. Study 1 tested the validity of a reduced version of the 26-item Writing Apprehension Scale (WAS; $N =$

194). Exploratory factor analyses revealed a 12-item scale (WAS-12) with two factors (affect and concern), cross-validated in an independent sample ($N = 220$). Further supporting WAS-12 validity and reliability, results revealed good reliability coefficients, along with correlations with external correlates and association with writing performance in the expected direction. Study 2 tested the association of the affect and concern WAS-12 dimensions with writing frequency, process, and performance ($N = 62$). Results showed unique contributions of affect to writing frequency and revising occurrences as well as of concern to planning occurrences, translating occurrences, and writing fluency. Notably, despite there was no association of writing apprehension with writing performance, mediation analysis showed that concern hampered text quality by reducing writing fluency. Practical implications of reported findings will be discussed.

Biases in the Recognition of High Cognitive Ability by Teachers and Peers

Keywords: Achievement, Assessment methods and tools, Intelligence, Motivation

Presenting Author:Jeroen Lavrijsen, KU Leuven, Belgium; **Co-Author:**Karine Verschueren, KU Leuven, Belgium

The question of whether teachers are able to accurately detect giftedness among their students has a long history. In contrast to earlier studies, which mostly considered teacher nominations in the context of gifted program selection, this paper focuses on a direct measure of how well teachers recognize high cognitive ability among their students. Drawing on data from a large Flemish study (2,587 students from Grade 7), we modelled the probability that a student was selected on the basis of measured ability and other factors. Although we explicitly urged teachers to select on potential instead of performance, nominations primarily reflected everyday achievement (GPA) and engagement, not cognitive ability. All other things being equal, girls were less likely to be nominated by their teacher as highly able. While students with low-educated parents were also less likely to be nominated, this was explained by their lower everyday achievement. Finally, we asked the students themselves to nominate classmates whom they believed to be highly able. This yielded results comparable to the results from the teacher nominations.

Unpacking Feedback Types and Modes: An Analysis of Student-Teachers' Meaning-Making

Keywords: Assessment methods and tools, Higher education, Language (Foreign and second), Writing/Literacy

Presenting Author:Michel Cabot, University of Oslo, Norway

The value of written and oral corrective feedback for the development of metalinguistic knowledge has been acknowledged in the research literature for decades. Yet, teachers in English as a foreign language teacher education programs know little about student-teachers' perceptions of meaningful grammar feedback. Thus, the aim of the present qualitative case study is to analyse student-teachers' reasons for favouring certain feedback types and modes and the role of such feedback in their learning ecologies. Data were first collected through the analysis of two literary essays written by 12 student teachers at a university college in Western Norway. The lecturer provided written and oral conference feedback only on the first essays (phase 1). Finally, we carried out two pilot, ten in-depth and four member check interviews (phase 2). Both essays were used as stimulated recall during these interviews. This article is primarily based on phase 2. Theories on agency and learning ecologies were integrated with feedback and language development theories. Surprisingly, all students liked unfocused and direct feedback because they expected feedback to be like real-world writing with a high degree of accuracy. Furthermore, the findings indicate a generally high appreciation of metalinguistic feedback because it helped them know the true causes of the errors. The findings demonstrate the importance of a varied use of feedback types and modes, which create important moments in student-teachers' learning trajectories. The described case may function as an inspiring example of exemplary practice for teachers and teacher educators who wish to develop their feedback practices.

Developing evaluative judgements in large classes: Generic skills and Content knowledge

Keywords: Assessment methods and tools, Competencies, Lifelong learning, Mathematics

Presenting Author:Viivi Virtanen, University of Helsinki, Finland; **Co-Author:**Johanna Rämö, University of Helsinki, Finland; **Co-Author:**Jokke Häsä, University of Helsinki, Finland

In this paper, we draw attention to assessment practices in university first-year mathematics by examining an implementation of student self-assessment processes into large class setting. We especially focus on students' capability to make decisions on their own work by exploring the accuracy of self-assessments both in content knowledge and domain specific generic skills, such as reading and writing mathematics. During the self-assessment processes, a total of 158 students frequently evaluated the quality of their learning outcomes, received feedback on their performance, and finally decided their own grades according to particular criteria. The problems aroused by large class setting were resolved by using digital and automatic verification and feedback. The intended learning outcomes explicitly made transparent through rubrics included both content knowledge and domain-specific generic skills. In the analysis, we compared the final grades students gave themselves on the two topics, namely, one of content knowledge and of generic skills with the results of the automatic verification of that self-assessment. The distribution of differences between the computed grade and student self-assessed grade were examined, and to quantify the agreement between computed and student grades, Kendall's tau coefficient was computed between the two variables for both topics. The agreement was higher for content knowledge ($\tau = 0.61$) than for generic skill ($\tau = 0.57$), although both are relatively high values. Our results indicate that self-assessment can act as a way to foster students' capability in making evaluative judgements also on generic skills, that are often viewed as crucial competences for future employment.

Session O 2

15 August 2019 12:00 - 13:30

Lecture Hall - H08

Single Paper

Motivational, Social and Affective Processes

Motivation

Keywords: Achievement, Developmental processes, Educational Psychology, Goal orientation, Higher education, Motivation, Pre-service teacher education, Quantitative methods, Self-efficacy

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Marjaana Veermans, University of Turku, Finland

Growing Perceptions of Control reduce Dropout Risk and enhance Achievement - A Longitudinal Study

Keywords: Achievement, Developmental processes, Higher education, Motivation

Presenting Author:Lisa Respondek, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany; **Co-Author:**Jeremy M. Hamm, Concordia University, Canada; **Co-Author:**Ulrike Nett, Augsburg University, Germany

Although research shows higher levels of students' control perceptions over their academic outcomes (perceived academic control) are associated with academic adjustment in the first year of university, little is known about how changes in perceived academic control over multiple years relate to longitudinal university dropout and grades. Thus, our three-year study ($N = 1009$) examined whether changes in perceived control predicted university dropout and whether this relationship was mediated by university grade point average (GPA). Latent change score models showed an overall decline of perceived academic control within the first and second academic years, with high individual variability. Discrete time survival analysis models showed that positive changes in perceived control were associated with reduced dropout rates and enhanced GPA over time (reciprocal relations). Finally, we confirmed that the relationship between perceived control and second year dropout was fully mediated by second year GPA. Findings advance the literature in highlighting reciprocal linkages between perceived academic control and university grades and their influence on subsequent dropout. Thus, to foster long-term university success institutions and instructors should provide early supports to help maintain and enhance students' control perception.

Pre-Service Teacher Self-Efficacy in the Context of Practicum of Teaching

Keywords: Motivation, Pre-service teacher education, Quantitative methods, Self-efficacy

Presenting Author:Esen Uzuntiryaki Kondakci, Middle East Technical University, Turkey; **Co-Author:**Yesim Capa Aydin, Middle East Technical University, Turkey; **Co-Author:**Zubeyde Demet Kirbulut, Harran University, Turkey; **Co-Author:**Aydan Boran, Middle East Technical University, Turkey

The present study aims to test a model in which teacher self-efficacy was predicted by pre-service teachers' engagement in practicum and their perceptions of cooperating teacher and cooperating school. Data were collected from a total of 356 pre-service teachers using Teachers' Sense of Efficacy Scale, Utrecht Work Engagement Scale, Relationship with Mentor Scale, Your Mentor as a Teacher Scale, and Teaching Support Scale. Results of Structural Equation Modeling indicated that engagement in practicum and teaching support significantly predicted teacher self-efficacy while relationship with the cooperating teacher and perceptions of the cooperating teacher's teaching were not significant. Discussion and implications for teacher education will be provided.

Beyond the entity-incremental dichotomy: Different constructions of meaning systems

Keywords: Achievement, Educational Psychology, Motivation, Quantitative methods

Presenting Author:Junlin Yu, Cambridge University, United Kingdom; **Co-Author:**Ros McLellan, Cambridge University, United Kingdom

People's implicit theories of intelligence give rise to distinct beliefs, goals, and behaviours, commonly thought to produce a dichotomous pattern of motivation organised around an entity or incremental theory. Although variable-centred research supports the links among implicit theories, effort beliefs, goal orientations, and learning strategies, little is known about how this network of interrelated variables are combined within individuals. Therefore, the current study adopted a person-centred approach to explore students' own constructions of meaning systems. Based on data from 535 secondary school students in England, latent profile analyses revealed four subgroups with distinct meaning systems. Although two subgroups supported the classic incremental theory–mastery goal (purely incremental) versus entity theory–performance goal (purely entity) pairings, a third of the students showed alternative constructions of meaning systems. One group of students reported high levels of performance-approach and -avoidance goals alongside an incremental theory (incremental-competitive), while another group reported an entity theory but low levels of both performance goals (entity-amotivated). Gender was a significant predictor of profile memberships, such that girls were overrepresented in incremental-based profiles and boys in entity-based profiles. These distinct profiles differentially predicted student achievement over time. The purely incremental and incremental-competitive profiles were the highest achieving groups in English, and in mathematics, the incremental-competitive group even outperformed the purely incremental group. The results provide a nuanced understanding of how students' implicit theories and the corresponding beliefs, goals, and behaviours cohere into complete systems. Implications for addressing the gender achievement gap at school are also discussed.

Association of self-efficacy and achievement goals in university lecturers teaching

Keywords: Goal orientation, Motivation, Quantitative methods, Self-efficacy

Presenting Author:Julia Hein, University of Mannheim, Germany; **Co-Author:**Stefan Janke, University of Mannheim, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany; **Co-Author:**Oliver Dickhaeuser, University of Mannheim, Germany

According to the hierarchical model of approach and avoidance achievement motivation, self-efficacy is a predictor of achievement goals. We investigated whether the associations can be found in university lecturers' professional goal pursuit as well. We try to fill a research gap in the effects of self-efficacy on situation-specific achievement goals. Considering construal-level theory, differences in level of construal should go along with differences in the strength of associations. In general, the predictive utility of dependent variables is maximized, if dependent and independent variables are operationalized at the same level. Therefore, we propose situation-specific self-efficacy as better predictor for situation-specific achievement goals than more global self-efficacy measures, because the assessment of situation-specific self-efficacy considers the task-specificity. We investigated this hypothesis for lecturers' in a micro-longitudinal study in the teaching domain. Therefore, we questioned a sample of 85 German university lecturers in the first five weeks of a semester before teaching their class about their specific goals in this class as well as their self-efficacy in this situation resulting in 390 measurement occasions. In a baseline questionnaire one week before the start of the semester, we asked them about their context-specific self-efficacy on a trait level (self-efficacy in teaching). Applying a multilevel structural equation model, we found positive effects of situation-specific self-efficacy on situation-specific achievement approach goals between participants even controlled for their context-specific self-efficacy, but no within effects of situation-specific self-efficacy. These findings demonstrate the impact of situation-specific self-efficacy on situation-specific achievement goals and close the mentioned gap.

Session O 3

15 August 2019 12:00 - 13:30

Seminar Room - S11

Single Paper

Educational Policy and Systems

Qualitative Methods in Researcher Education

Keywords: Doctoral education, Early childhood education, Educational policy, Morality, Peer interaction, Problem solving, Qualitative methods, Reasoning, Researcher education

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 24 - Researcher Education and Careers

Chairperson: Carla Oonk, Wageningen University, Netherlands

Design Characteristics of Play Areas and Children's Play Preferences

Keywords: Early childhood education, Educational policy, Qualitative methods, Researcher education

Presenting Author:Serap Sevimli-Celik, METU, Turkey; **Co-Author:**Sebnem Cetken, Usak University, Turkey

The aim of this study was to investigate the design of preschool outdoor play areas regarding the children's play preferences while using behavioral mapping method. During the outdoor play time, a total of 102 preschoolers were observed which lasted one and a half month. For the data collection process, The Playground's Physical Elements and Environmental Characteristics Indicative Scoring Scale and Parten/Piaget Play Recording Form were used. With these instruments, 6 outdoor play areas were investigated according to their design characteristics, play materials and equipment, and children's play preferences. The findings indicated that the design of the outdoor play area would affect children's play types and play preferences. Traditional outdoor play areas' design features usually guided children to engage in functional and solitary play. On the other hand, playgrounds which have more natural elements gave children opportunities to engage in constructive and creative play.

Scaffolding a collaborative learning process in research ethics among novice researchers

Keywords: Doctoral education, Qualitative methods, Reasoning, Researcher education

Presenting Author:Anu Tammeleht, University of Helsinki, Estonia; **Co-Author:**Maria Jesus Rodriguez-Triana, Tallinn University, Estonia; **Co-Author:**Erika Lõfström, University of Helsinki, Finland

The increasing concern about ethics and integrity in research communities has brought attention on how students and junior academics are trained on this regard. This study increases understanding of the learning processes through which novice researchers develop their research ethics and integrity competencies. More specifically, the aim was to understand how MA and PhD students approach ethical reasoning, and what kind of scaffolding supports their learning. To answer the aforementioned research questions, quantitative and qualitative data were collected during the study (recorded group work around ethics cases, student group reports, pre- and post-questionnaires). For the group report, students had to answer a list of questions that guided them (as a form of scaffolding) towards the identification of potential ethical issues within the cases. To answer the questions, students were instructed to utilize reference materials such as the ALLEA Code of Conduct for Researchers. Since the learning activities and the reports were carried out collaboratively, the analysis focus on the group rather than on individual level. These data were analysed utilizing the SOLO taxonomy (Biggs, 1999; Biggs & Tang, 2007). Findings indicate that ethical reasoning varies non-linearly between the academic levels, hence scaffolding needs to be altered to help students achieve higher levels of

understanding past an evident threshold.

Doctoral students' experiences of the ethics of supervision

Keywords: Doctoral education, Morality, Qualitative methods, Researcher education

Presenting Author:Marvi Remmik, University of Tartu, Estonia; **Co-Author:**Liana Roos, University of Tartu, Estonia; **Co-Author:**Erika Lõfström, University of Helsinki, Finland

Regardless of the significant spotlight on the quality of doctoral studies in the recent decade, the efficiency of the studies still remains a serious issue. Supervision is seen as one of the most influential factors influencing the course of PhD studies. Although different factors in supervision are researched, the ethical aspects of this often hierarchical relationship are studied less. Supervisors are often influenced by their own previous experiences as a PhD student, and may reproduce unintentional practices. The aim of the research was to understand the nature of the ethical dilemmas doctoral students experience. The data were collected among doctoral students (N=90) at an Estonian university with a questionnaire. The ethical principles framework. (Kitchener 1985) served as a theoretical lens for analysing ethical issues in supervision. The results showed that doctoral students experienced a variety of situations related to five ethical principles, namely respect for autonomy, beneficence, non-maleficence, justice and fidelity. These included experiences of being neglected for having different viewpoints, unprofessional treatment by the attestation committee, lack of support, being an economic laborer, difficulties combining the studies with other roles, financial issues, inadequate supervision, student's inability to keep a commitment. The results pave the way for suggestion on how to develop supervisor training and institutional supervisory practices.

Research integrity as a core transversal academic career competence: Identifying expert learning

Keywords: Peer interaction, Problem solving, Qualitative methods, Researcher education

Presenting Author:Erika Lõfström, University of Helsinki, Finland

The objective of the study was to identify how expertise in research integrity is developed and sustained among individuals with substantial expertise in this domain. The study utilizes a qualitative research approach. Fifteen experts on research integrity took part in workshops solving integrity dilemmas collaboratively. The data were based on participants' written reflections at the end of the six sessions. The responses were analysed through inductive content analysis. Two main facilitators regulated the experts learning, namely 1) collaborative exchange among other experts, and 2) being exposed to differences in contexts, experiences and thinking. The study raises the following implications: the knowledge can be used for designing more effective advanced training for senior academics who usually fall outside existing training schemes because as well as for enhancing basic training for doctoral students and early career researchers to help them develop expert-like approaches to research ethics.

Session O 4

15 August 2019 12:00 - 13:30

Seminar Room - S09

Single Paper

Instructional Design, Teaching and Teacher Education

Instructional Design and Experimental Studies

Keywords: Cognitive skills, Comprehension of text and graphics, Experimental studies, Goal orientation, Instructional design, Motivation, Quantitative methods, Teaching approaches, Teaching/instruction

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education

Chairperson: Mari-Pauliina Vainikainen, Finland

Is your imagination sufficient? Effects of mental images on learning outcome and cognitive load

Keywords: Cognitive skills, Comprehension of text and graphics, Experimental studies, Instructional design

Presenting Author:Patrick Albus, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

When designing effective learning material, we often use pictures to maximize learning progress and to reduce cognitive load at the same time, thereby fostering the development of mental models. Self-generating these pictures also provide the basis to develop coherent knowledge structures. While learning, maybe just imagining a picture of the material could help to create a proper mental model. In this study, 59 students studied a text about a clutch. They were randomly assigned to four groups where they had to either read the text with no additional help, self-generate a drawing, imagining a picture of a clutch or were presented with an external picture. A post-test to measure retention and comprehension as well as cognitive load was conducted. This study showed that there are no significant differences between the groups regarding retention. Participants that studied with an external picture had significantly higher comprehension scores and germane cognitive load while simultaneously lower extraneous load compared to the text-only group. However, we found no evidence that drawing or imagining a picture is more helpful than text-only to generate a proper mental model. Further research is needed to explore suitable framework conditions.

The Influence of Background Music on Learners with varying Extraversion

Keywords: Comprehension of text and graphics, Experimental studies, Instructional design, Quantitative methods

Presenting Author:Janina Lehmann, Ulm University, Germany; **Co-Author:**Tina Seufert, Ulm University, Germany

Background music as one kind of seductive detail seems to have a negative impact on learning. However, slow background music may also decrease the learner's arousal level which is preferred by low extraverted learners and might thereby benefit their learning outcomes. Thus, we assume no main effect of background music on learning outcomes but an interaction effect between slow background music and the learner's extraversion level. We tested 167 high school students and found better transfer outcomes for the group with background music. Thus, background music might ease deeper learning processes. Furthermore, in the group without background music, learners with higher extraversion showed better recall performance. This was not found in the group with background music, which is a hint that background music decreased arousal. Even though this decrease in arousal could not be detected in this study, it was found in an additional study with a more precise measurement for arousal.

When does testing protect against forgetting? – Not when students have high mastery motivation.

Keywords: Experimental studies, Goal orientation, Instructional design, Motivation

Presenting Author:Alexander Eitel, University of Freiburg, Germany; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Valentin Hörbrand, University of Freiburg, Germany; **Co-Author:**Fiona Wilke, University of Freiburg, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

The testing effect refers to the phenomenon that students score better in delayed tests of knowledge when they were tested on these contents before rather than when having restudied them. Compared to restudy, testing requires students to retrieve and elaborate on the study contents, i.e. to engage in active processing. Students are not assumed to engage in such active processing during restudy, hence leading to increased forgetting in such a condition. However, as we hypothesize here, some students may indeed engage in active-elaborative processing even in the restudy condition. These students are, by definition, those with a high mastery motivation (as a stable goal orientation). Accordingly, students with a high mastery motivation may profit both from testing and from restudy potentially not revealing a testing effect (moderated testing-effect hypothesis). To test the hypothesis, we first assessed mastery motivation of 64 students, and then randomly assigned them to either a testing or a restudy condition. All participants answered questions from a knowledge test one week later. Results were in line with the moderated testing-effect hypothesis: Students with low to medium levels of mastery motivation showed a testing effect whereas students with high mastery motivation did not. Hence, testing may be beneficial for long-term retrieval especially for students who would otherwise use restudy opportunities in a suboptimal manner.

Does Socratic teaching foster learning?

Keywords: Experimental studies, Instructional design, Teaching approaches, Teaching/instruction

Presenting Author:Christof Wecker, Universität Hildesheim, Germany; **Co-Author:**Corinna Behrendt, University of Hildesheim, Germany; **Co-Author:**Melissa

Windler, University of Hildesheim, Germany

In Socratic teaching, the teacher does not simply “communicate” content to the learners, but the learners have to infer the learning content while being guided by the teacher’s questions. Although this approach is quite common among teachers at least in some countries, apparently its effectiveness has not been investigated intensively in empirical studies. The present experimental study investigated the effects of Socratic teaching compared to a teacher presentation on knowledge acquisition as well as motivational and affective variables. A sample of 125 university students participated in a pretest-posttest-follow-up control group design with the two conditions Socratic teaching and teacher presentation. In addition to explanatory knowledge and knowledge application, subjective knowledge, interest and several affective variables were measured in an immediate posttest and a follow-up test. No effects of Socratic teaching on knowledge application were found. Small positive effects of Socratic teaching on subjective knowledge and interest (in one of the tests) as well as rather large positive effects on several affective variables were found. The findings do not provide strong evidence for a superiority of Socratic teaching compared to a teacher presentation. Nevertheless, Socratic teaching may be advantageous with respect to motivational and affective variables and constitute a reasonable instructional option.

Session O 5

15 August 2019 12:00 - 13:30

Lecture Hall - H10

Single Paper

Teaching and Teacher Education

Mixed-method research in Teaching and Instruction

Keywords: Conversation/ Discourse analysis, Mathematics, Mixed-method research, Professions and applied sciences, Quasi-experimental research, School effectiveness, Synergies between learning teaching and research, Teacher Effectiveness, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Michiel Voet, Ghent University, Belgium

Investigating Classroom Teachers’ Development of Mathematical Task Implementation Quality

Keywords: Mathematics, Mixed-method research, Teacher professional development, Teaching/instruction

Presenting Author: Engin Ader, Boğaziçi University, Turkey

This mixed-method study investigates the quality of teachers’ implementation of mathematical tasks and the nature of changes that occurred during an academic year with the support of a professional development program. Task implementation quality consists of three dimensions: total cognitive demand, attention to student thinking and intellectual authority. The study took place in the context of a 1-year professional development program, with the participation of four teachers in a private school. Data were gathered from class observations and meetings with teachers. Both quantitative and qualitative analyses indicated changes in the teachers’ practice. The major change was in the total cognitive demand in the implementation of tasks. An analysis of changes in cognitive demand level reveals fluctuations in the total cognitive demand of mathematical tasks, indicating that changes in teaching practice are complex and often nonlinear. The findings are discussed along with potential teacher-related factors. Recommendations are made for future research on professional development programs.

Teaching as a Clinical Profession: Revisiting the Medical Model of Professional Work in Teaching

Keywords: Conversation/ Discourse analysis, Professions and applied sciences, Synergies between learning teaching and research, Teaching/instruction

Presenting Author: Ayelet Becher, Ben-Gurion University of the Negev, Israel; **Co-Author:** Adam Lefstein, Ben-Gurion University of the Negev, Israel

Recent efforts to improve teacher work emphasize the clinical character of teaching. This view is grounded in a medical model of professional work, in which professional judgements about diagnosis and treatment are informed by an empirically grounded body of knowledge. However, this model seems to be at odds with the contested and problematic state of knowledge in teaching and the ongoing debate about whether and how research can inform teaching. In this paper, we problematize efforts to transform teaching into a clinical profession according to the medical model. To this end, we take up a theoretical investigation of Abbott’s (1988) thesis on professional work in relation to teaching, drawing on research on teaching and fine-grained analysis of documented teaching scenarios. Our investigation points to several critical gaps between Abbott’s dimensions of clinical work (i.e., diagnosis, treatment and inference) and core conditions of teaching practice. We offer adaptations of Abbott’s framework for thinking about teachers’ work. We also highlight crucial issues that have been overlooked in recent discussions of teacher professionalization.

Does feedback by school leaders affect teachers’ professional development and teaching quality?

Keywords: Quasi-experimental research, School effectiveness, Teacher professional development, Teaching/instruction

Presenting Author: Christopher Kellermann, Freie Universität Berlin, Germany; **Presenting Author:** Max Nachbauer, Freie Universität Berlin, Germany; **Co-Author:** Holger Gaertner, Freie Universität Berlin, Germany; **Co-Author:** Felicitas Thiel, Freie Universität Berlin, Germany

In school effectiveness and school improvement research, feedback by school leaders is viewed as an effective lever to initiate teachers’ professional development and to enhance teaching quality. Findings from the field of *teacher evaluation* and *teacher coaching* confirm this assumption. However, there are no studies using an experimental design to examine the specific effect of school leaders’ feedback on teachers’ professional development and teaching quality. Therefore, a pretest-posttest quasi-experimental study design was applied to evaluate the effects of feedback given by school leaders to teachers. Participants included $N = 70$ teachers and $N = 1050$ students in six vocational schools in a major city in Germany. Regression analysis yielded no significant effect of school leaders’ feedback on self-assessed teachers’ professional development. Analyses regarding the effects of feedback on teaching quality and differential effects of feedback are currently in process and will be presented at the conference. Results are discussed against the background of the implementation of the feedback intervention and methodic limitations.

Comparing self-perceived knowledge about classroom management to student misbehaviour

Keywords: Mixed-method research, Teacher Effectiveness, Teacher professional development, Teaching/instruction

Presenting Author: Sabine Schlag, University of Wuppertal, Germany; **Co-Author:** Sabine Glock, Bergische Universität Wuppertal, Germany

Classroom management is a crucial component of successful teaching. Research showed that the reaction to student misbehaviour (reactive strategies) is not essential for successful classroom management but rather the implementation of preventive strategies. Four preventive strategies have been identified to profoundly contribute to classroom management: withitness and overlapping, smoothness and momentum, group alerting and challenge and variety in assignments. When approaching these preventive strategies, questionnaires to assess self-perceived knowledge are often used without considering the relation to students’ behaviours in the classroom. The aim of this study was to assess whether teachers self-perceived knowledge about their classroom management correlates with their students’ behaviours (e.g., number of disruptions). We conducted a study in which teachers ($N = 58$) from German primary and secondary schools were surveyed (classroom management questionnaire) and we additionally observed their lessons (in total 90 minutes). Results show that the self-perceived knowledge about preventive strategies correlated with students’ behaviours. For example, teachers who indicate a high group alerting have less verbal disruptions and less inattention during class. This indicates that teachers’ self-perceived knowledge about classroom management has an effect on classroom activities. Furthermore, these results give an insight into what questionnaires about self-perceived knowledge determine and how this is related to other elements such as student misbehaviours.

Session O 6

15 August 2019 12:00 - 13:30

Lecture Hall - H06 - Amazon Hörsaal

Single Paper

Educational Policy and Systems, Teaching and Teacher Education

Educational Policy

Keywords: Attitudes and beliefs, Cultural diversity in school, Educational policy, Language (Foreign and second), Secondary education, Survey Research, Teacher Effectiveness

Interest group: SIG 11 - Teaching and Teacher Education, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Sarah Marrs, United States

Happy teachers, happy schools

Keywords: Educational policy, Secondary education, Survey Research, Teacher Effectiveness

Presenting Author: Kim Ouweland, Erasmus University Rotterdam, Netherlands

The Netherlands is faced with an increasing shortage in qualified high school teachers. In tackling this problem, the Dutch government is planning actions, one of which is aimed on retention of qualified teachers in the teaching profession. It has been found that teachers who are satisfied with their jobs, are less prone to leave the teaching profession. Furthermore teacher self-efficacy is a major contributor to job satisfaction. In the present study we were interested whether there would be differences between schools with a staff scoring relatively high on teacher job satisfaction and self-efficacy (i.e. happy schools) and schools scoring lower on these variables (less happy schools) in the extent to which these schools show characteristics of professional learning communities (PLC). It was found that in happy schools the teaching staff rated a higher presence of the PLC characteristics *shared purpose* and *collaborative activity* in their schools than the staff in less happy schools. This reflects that in schools with the most satisfied and qualified teachers, the staff perceived more common ground with their co-workers on the purpose of the school community and perceived their work environment as more supportive and cooperative. In terms of practical implications we suggest that to keep good teachers in the profession, *shared purpose* and *collaborative activity* should be a priority in constructing and conducting school policies. Think for example of promoting distributed leadership and structured collaboration time within the school community.

Teacher satisfaction in high poverty schools in Estonia, Georgia, and Latvia

Keywords: Educational policy, Secondary education, Survey Research, Teacher Effectiveness

Presenting Author: William Smith, University of Edinburgh, United Kingdom

Provided the shared post-soviet context and the rapidly declining school-aged population, this comparative study of teachers in Estonia, Georgia, and Latvia can shed light on alternative approaches to increased teacher satisfaction for countries in similar contexts that are unable to make across the board increases in teacher salary. The focus on high poverty schools is essential in these countries as the changing demographics and present school funding mechanisms disproportionately affect rural schools which are often high poverty. This study addresses two pressing research questions, exploring each independently for Estonia, Georgia, and Latvia: 1) How do teacher satisfaction and other teacher characteristics differ by school poverty level? 2) What policy relevant factors are related to increased satisfaction for teachers in high poverty schools? Data from the 2013 Teaching and Learning International Survey (TALIS) were used in this study. Given the dichotomous measures of the outcome variable (teacher satisfaction), hierarchical generalized linear modeling (HGLM) was the primary method of analysis. Although the policy implementation and internalization process is challenging, this study indicates that simplistic, externally driven policy solutions, such as introducing induction programs or changing the contract status of teachers, are not as effective in increasing teacher satisfaction as investments that contribute to a positive school climate where teachers feel valued and included as professionals.

New multilingual education policies in a country of old multilingual settlement

Keywords: Attitudes and beliefs, Cultural diversity in school, Educational policy, Language (Foreign and second)

Presenting Author: Adrian Lundberg, Malmö University, Sweden

Multilingualism is ubiquitous in mainstream education and has increasingly found its way into educational policy documents. Teachers interpret these documents and make pedagogical decisions based on their viewpoints in order to manage their classrooms. The overtly multilingual polity of Switzerland underwent a paradigmatic shift in language teaching in line with a multilingual turn and provides a particularly useful context to investigate the covert educational language policy by exploring teachers' viewpoints about multilingualism. Sixty-seven primary teachers rank-ordered two sets of statements about the understanding of and their pedagogical actions with regard to multilingualism and multilingual students. The holistic Q method results uncover a strong consensus about the nature of multilingualism and a variety of pedagogical language management actions. In conclusion, more time in pre- and in-service teacher education shall be spent on raising teachers' self-awareness as policy makers and achieving more equal and individualised learning opportunities in linguistically diverse classrooms.

Session O 7

15 August 2019 12:00 - 13:30

Lecture Hall - H09

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Motivational, Social and Affective Processes

Emotion and Affect

Keywords: Achievement, Assessment methods and tools, Cognitive skills, Collaborative Learning, Computer-supported collaborative learning, Educational technology, Emotion and affect, Motivation and emotion, Social interaction, Technology, Video analysis

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Tsafir Goldberg, University of Haifa, Israel

Exploring groups' situational affective states during collaborative learning

Keywords: Collaborative Learning, Emotion and affect, Motivation and emotion, Video analysis

Presenting Author: Tiina Törmänen, University of Oulu, Finland; **Co-Author:** Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Kristiina Kurki, University of Oulu, Finland

Emotional atmosphere of collaborative groups is constructed through multiple components, encompassing group members' emotional experiences, reactions and interactions. However, we lack evidence on how short-term affective states within a group are composed in a situation, how they vary during collaborative learning, and gradually, build up the course of collaborative learning. Exploring micro level variation in groups' affective states could reveal conditions causing changes in emotional atmosphere, but it poses a methodological challenge of tracing this variation as it unfolds. New process-oriented, multimodal methods provide means to capture data on different layers of affective states as they occur. This study explores the variation in groups' affective states during a collaborative learning session by combining video data observations with data on group members' physiological activation (EDA). The participants were 12-year old primary school students (N=31, 10 groups) performing a collaborative science task. Valence of groups' affective state (positive, negative, mixed, neutral) was identified from video data and group members' physiological activation level was measured with Empatica E4 wristbands. The results show that valence of groups' affective state was mostly neutral and physiological activation level was de-activating. However, when all or some group members were physiologically active, they also indicated significantly more emotional expressions; valence of these situations varied between negative, mixed and positive. The results indicate that physiologically activating situations are often also emotionally relevant. However, further studies are needed to explore these situations in relation to collaborative learning progress.

How do student learning prerequisites affect perceptions of supportive climate in ICT instruction?

Keywords: Assessment methods and tools, Cognitive skills, Emotion and affect, Technology

Presenting Author:Molly Hammer, University of Tuebingen, Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany

Despite the importance of the student perspective, student perceptions of instructional quality are sparsely used in evaluating ICT instruction. In general, student ratings of supportive climate in non-ICT environments contribute to explaining differences in learning outcomes. However, such ratings are mainly aggregated at the class level, missing the link to students' individual perceptions within a class. This is problematic as students with different cognitive and motivational-affective characteristics perceive learning environments quite differently. Previous research shows that students with low cognitive ability and prior content knowledge as well as low class self-concept and class interest are less likely to perceive instruction as supportive. Regarding learning with ICT, there are also first indications that student learning prerequisites relate to their learning process. The aim of this study is to investigate the factors that influence students' perceptions of instructional quality in tablet integrated biology classes. Therefore, a person-centered approach is used that allows to look at multiple characteristics within an individual. Latent profile analysis revealed four distinct combinations of individual student learning prerequisites. These profiles in turn predicted students' perceptions of supportive climate when working with tablets and when not working with tablets. Results show differences in how students perceive supportive climate depending on their learning prerequisites and these differences are consistent for instruction with and without tablets.

Effects of process heterogeneity in collaborative learning with tablets

Keywords: Computer-supported collaborative learning, Educational technology, Emotion and affect, Social interaction

Presenting Author:Armin Weinberger, Saarland University, Germany; **Co-Author:**Lara Johanna Schmitt, Saarland University, Germany; **Co-Author:**Dimitra Tsovaltzi, Saarland University, Germany

The perspective of embodied cognition assumes that our bodily experiences shape and support cognitive processes as our body interacts with the world. Therefore, active bodily movements may be integrated in learning environments to foster learning. Collaborative learning with a shared touch interface involves learners on multiple modes of interaction, bodily and cognitive, but interaction patterns may differ between learners within a group. Little is known about the effects of such group heterogeneity in different dimensions of learning processes to account for embodied learning. We analyze heterogeneous cognitive and bodily processes during learning with a shared tablet. Depending on the degree of bodily process heterogeneity, learners either focused on high quality talk (homogenous) or on high performance (heterogeneous) within the tablet app. Cognitive process homogeneity related to content analysis fostered knowledge outcomes.

Achievement Emotions Predict the Collaborative Problem-Solving Performance of Adolescents

Keywords: Achievement, Computer-supported collaborative learning, Emotion and affect, Motivation and emotion

Presenting Author:Jesus Camacho-Morles, The University of Melbourne, Australia; **Co-Author:**Gavin Slep, The University of Melbourne, Australia; **Co-Author:**Lindsay Oades, The University of Melbourne, Australia; **Co-Author:**Lucy Morrish, The University of Melbourne, Australia; **Co-Author:**Claire Scoular, The University of Melbourne, Australia

We explored the relationship between adolescents' activity-based achievement emotions and their performance during collaborative problem solving (CPS) tasks, which was operationalized as having objective social and cognitive performance dimensions. Participants were 100 adolescent dyads ($n = 200$) who completed a series of five computer-based CPS tasks while their activity emotions of enjoyment, boredom, and anger were recorded. It was hypothesized, using a partially mediated structural regression model, that individual differences in students' activity emotions would predict effort regulation, which in turn, would predict both CPS social and cognitive performance. On the basis that more effective collaboration efforts enable better cognitive performance, we also expected CPS social performance to predict CPS cognitive performance. Our hypothesized model fit the data well. All emotions were associated with effort regulation, and effort regulation predicted cognitive performance but showed a weak association with social performance. Instead, anger and enjoyment predicted CPS social performance directly. Our findings provide valuable insight into the role of affective experiences in the growing area of measuring 21st-century skills in educational settings.

Session O 8

15 August 2019 12:00 - 13:30

Seminar Room - S16

Single Paper

Learning and Instructional Technology, Teaching and Teacher Education

Technology-Enhanced Learning and Instruction

Keywords: Attitudes and beliefs, Cognitive skills, Content analysis, E-learning/ Online learning, Educational technology, In-service teacher education, Learning approaches, Quantitative methods, Science education, Social interaction, Teacher Effectiveness, Teacher professional development, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Lois George, Jamaica

A Social Capital MOOC Design for the Delivery of High-Quality PD to Science Teachers

Keywords: E-learning/ Online learning, Social interaction, Teacher Effectiveness, Teacher professional development

Presenting Author:Susan Yoon, University of Pennsylvania, United States; **Co-Author:**Kate Miller, University of Pennsylvania, United States; **Co-Author:**Joeeun Shim, University of Pennsylvania, United States; **Co-Author:**Daniel Wendel, Massachusetts Institute of Technology, United States; **Co-Author:**Ilana Schoenfeld, Massachusetts Institute of Technology, United States; **Co-Author:**Emma Anderson, Massachusetts Institute of Technology, United States; **Co-Author:**David Reider, Education Design, United States

This research describes a design and development approach to improving science teacher's access to high quality PD. Working with a small number of teachers, this proof-of-concept exploratory study details how we combined social capital mechanisms with essential teacher learning and PD requirements to overcome existing challenges in the delivery of a PD course in a fully online asynchronous MOOC. Findings reveal comparably high satisfaction and usability of course materials as compared to previous face-to-face PD with similar content. Teachers also articulated positive experiences as a result of the intentional social capital course design in the areas of tie quality, depth of interaction, and access to expertise. However, the development of trust among teachers was harder to construct. Implications for this work for asynchronous online PD approaches are discussed.

Teachers, tablets, training - the acquisition of new skills in the use of mobile technologies

Keywords: Content analysis, In-service teacher education, Teacher professional development, Technology

Presenting Author:Lara Gerhardt, University of Paderborn, Germany; **Co-Author:**Lukas Dehmel, University of Paderborn, Germany; **Co-Author:**Dorothee M. Meister, University of Paderborn, Germany

More and more effort is put into the digitalization of schools. In times of mobile learning tablet computers play an important role in this context. One can find many contributions concerning the tablet-aided learning processes of pupils by reviewing the research literature. However, there is a research gap regarding the teachers' perspective. Our paper aims at reconstructing their processes of tablet-related skill acquisition. Our findings are based on empirical data gathered in three different local schools. We conducted qualitative interviews and group discussions with class teachers, teachers acting as media advisers, special education teachers and headmasters. Additionally, we included several class observations. We used Qualitative Content Analysis to code and compare the different kinds of material. First results show that tablet-related skill acquisition is characterized by a mixture of formal and informal learning elements. Apart from internally differentiated learning opportunities informal peer cooperation within the teaching staff seems to be a crucial factor.

Exploring Sex Differences in Visuospatial Cognition in the Context of Organic Chemistry

Keywords: Cognitive skills, Educational technology, Quantitative methods, Science education

Presenting Author:Pavlo Antonenko, University of Florida, Ukraine; **Co-Author:**Matthew Schneps, University of Massachusetts, United States; **Co-Author:**Marc Pomplun, University of Massachusetts, United States; **Co-Author:**Andreas Keil, University of Florida, United States; **Co-Author:**Kara Dawson, University of Florida, United States; **Co-Author:**Richard Lamb, SUNY Buffalo, United States; **Co-Author:**Koh Do Hyong, University of Massachusetts, United States; **Co-Author:**Andrea Burgess, University of Florida, United States

The study examined differences regarding how effectively and efficiently males and females from a diverse group of 120 community college students compared models of molecules when these models were provided as 2D and 3D representations. Neither male nor female participants performed well on either the 2D or the 3D version of this organic chemistry mental rotation task. Female participants' performance on both the 2D version of the task and the 3D version was lower than the performance of males. Interestingly, the processing of 2D and 3D models of molecules in the female learners was influenced by two crystallized cognitive abilities that reflect language processing. List Sorting Working Memory Test, a measure of fluid cognition that focuses on working memory efficiency, was the only predictor of 3D task performance for females accounting for about 15 percent of the variance in 3D task performance. This study produced important implications regarding visuospatial ability and working memory training and design and implementation of courses that make use of 2D and 3D representations.

Middle-Schoolers' Attitudes To STEM in a 3D Scanning and Printing Infused Science Classroom

Keywords: Attitudes and beliefs, Educational technology, Learning approaches, Science education

Presenting Author:Pavlo Antonenko, University of Florida, Ukraine

Recognizing that education within the individual STEM disciplines has great value, educational researchers and practitioners are working to expand our understanding of integrated STEM learning (Roehrig et al., 2011). Our research project argues that effective integration of STEM can be achieved using 3D scanning and printing in the classroom within the context of a highly relevant but unexplored educational pathway to STEM in K-12 education – paleontology. Rather than being a specialized field, paleontology is truly a multidisciplinary science that organically integrates concepts and content from diverse disciplines including biology, environmental science, geology, oceanography, and anthropology. In this study, we followed a 6th grade science teacher who designed and implemented a science learning activity focusing on the structure and function of shark teeth integrating 3D scanning and printing practices that are used by paleontologists to identify and study fossils. Qualitative and quantitative measures were used to obtain a comprehensive view of how students and the teacher perceived the integrative STEM activity and the effects on their learning, self-efficacy, development of 21st century skills, and career interest. Quantitatively, we showed that the scores obtained using the S-STEM measure were reliable, and that students exhibited significantly better attitudes and self-efficacy toward science learning and competency in 21st century skills. Females demonstrated significantly higher Science Attitude scores than males on the posttest. Additionally, students improved in their interest towards three STEM careers: Biology/Zoology, Computer Science, and Medical Science.

Session 09

15 August 2019 12:00 - 13:30

Lecture Hall - H07

Single Paper

Higher Education, Motivational, Social and Affective Processes

Motivation

Keywords: Attitudes and beliefs, Educational attainment, Educational Psychology, Emotion and affect, Higher education, Motivation, Motivation and emotion, Quantitative methods, Reading comprehension, Self-regulation

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Frieder Schillinger, Technische Universität Dresden, Germany

Enjoyment and Anxiety in Reading Comprehension: Exploring Emotion Antecedents Across Grade Levels

Keywords: Emotion and affect, Motivation, Motivation and emotion, Reading comprehension

Presenting Author:Sonia Zaccoletti, University of Padova, Italy; **Co-Author:**Gianmarco Altoè, University of Padova, Italy, Italy; **Co-Author:**Lucia Mason, University of Padova, Italy

The aim of this study was to examine the relationships between control-value antecedents of enjoyment and anxiety related to reading comprehension, the two emotions, and reading comprehension performance across three grade levels. One hundred fifty-two 5th graders, one hundred and two 8th graders, and two hundred forty-two 11th graders completed self-reports for control and value antecedents of enjoyment and anxiety related to reading comprehension activity. Students also completed the Achievement Emotions Questionnaire-ES (AEQ-ES) in grade 5 (Lichtenfeld et al., 2012) and the AEQ in grades 8 and 11 (Pekrun, Goetz, & Perry, 2005). All participants performed a reading comprehension task. For all grade levels, gender and general cognitive ability were considered as control variables. For 5th graders expressive vocabulary and decoding skills were also taken into account. Three path analyses were performed. Results revealed variations in the relationships across the grade levels. The indirect and negative effect of control antecedent on reading comprehension, mediated by anxiety, emerged in 5th graders. The direct positive relationships between both control and value antecedents and reading comprehension emerged in 8th graders. However, the findings revealed no direct or indirect effects of the two motivational antecedents on reading comprehension in 11th graders. Different relationships across the three grade levels highlight the complexity of the interplay of factors that underlie reading comprehension, which may contribute differently in primary and lower or upper secondary school.

A diary study on motivational regulation, academic procrastination, and college dropout intentions

Keywords: Educational Psychology, Higher education, Motivation, Self-regulation

Presenting Author:Lisa Bäuлке, University of Augsburg, Germany; **Co-Author:**Martin Daumiller, University of Augsburg, Germany; **Co-Author:**Markus Dresel, University of Augsburg, Germany

Procrastination—a voluntary delay of an action despite negative consequences—is a widespread phenomenon in the academic context and has serious consequences for successful learning (Steel, 2007). Theoretically, it can be conceptualized as a failure in motivational self-regulation, which in turn is of great relevance in complex learning processes (Schwinger et al., 2009). Thereby, students can be distinguished on the basis of their knowledge about suitable motivational regulation strategies for different situations. It can be assumed that college dropout intentions are increased by dysfunctional regulation. Indeed, previous findings indicated a negative relation between motivational regulation strategy knowledge and academic procrastination as well as college dropout intentions (e.g., Bäuлке et al., 2018). However, it has not been investigated so far, how these three aspects interact in specific learning situations. Hence, we conducted a diary study over a period of 28 days during an examination phase with 2,685 single measurements of a total of 160 university students (mean age=21.7 years, $SD=2.2$; 53% female). Their procrastinating behaviour decreased over time until the first exam. Extensive conditional knowledge on motivational regulation strategies was accompanied by lower levels of procrastinating behavior and lower levels of college dropout intentions. Additionally, it enhanced the decline in procrastinating behavior and college dropout intentions until the day of the earliest exam. Overall, the results indicate an elevated risk of procrastinating behavior and college dropout intentions when students have limited conditional knowledge on motivational regulation strategies. This underlines the importance of motivational regulation for successful studying.

The Development and Validation of a new Multidimensional Test Anxiety Scale

Keywords: Attitudes and beliefs, Educational attainment, Emotion and affect, Quantitative methods

Presenting Author:Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:**Nathaniel von der Embse, University of South Florida, United States

A robust finding in the literature is that test anxiety is negatively related with educational achievement. More recently, concerns have been expressed that test anxiety may also contribute to low student wellbeing. Despite a long history in the psycho-educational literature, there is little consensus over the constituent components of test anxiety. Worry, cognitive interference, confidence, and irrelevant thinking, have been proposed as cognitive components, Autonomic reactions, tension, and bodily symptoms, have been proposed as affective-physiological components. The purpose of the present project was to develop a new multidimensional test anxiety scale (MTAS) based on a consensus among researchers over which domains comprise test anxiety. Having surveyed a panel of international test anxiety researchers and developed an preliminary pool of 40 items, an initial study used exploratory and confirmatory factor analyses to narrow the pool of items to 16-items loading on four factors (4 items each): worry and cognitive interference (cognitive components), and tension and physiological indicators (affective-physiological components). In the present study we sought to replicate this factor structure and examine relations with salient psycho-educational constructs including achievement. Data were collected from 5806 English secondary school students aged 11-19 years. A bifactor model showed a good fit to the data, strong factor loadings, and high internal consistency. Relations with external constructs were largely as expected; negative relations with adaptive psychological constructs (academic buoyancy, adaptability, wellbeing) and achievement, and positive relations with social and emotional risk. The MTAS has demonstrated sufficiently good psychometric properties to be used as a research instrument.

Session O 10

15 August 2019 12:00 - 13:30

Seminar Room - S15

Single Paper

Cognitive Science, Teaching and Teacher Education

Early Childhood Education

Keywords: Content analysis, Early childhood education, Metacognition, Primary education, Secondary data analysis, Secondary education, Self-regulation, Special education, Student learning, Teaching/instruction

Interest group: SIG 04 - Higher Education, SIG 15 - Special Educational Needs, SIG 16 - Metacognition

Chairperson: Marion Tillema, Avans Hogeschool / Avans University of Applied Sciences, Netherlands

Inclusive good practice in preschool: teachers point of view

Keywords: Content analysis, Early childhood education, Special education, Teaching/instruction

Presenting Author:Maja Antoniotti, University of Modena and Reggio Emilia, Italy; **Co-Author:**Alice Veneziani, University of Modena and Reggio Emilia - Department of Education and Human Sciences, Italy

Since 1982 Italian preschools are an inclusive context for all children with SEN. The research analyzes preschool teachers' opinions about their inclusive practices. This study means to identify the strategies adopted and recognized as crucial by teachers to promote inclusion in preschool context by using as reference Mitchell's evidence-based perspective (2014) and to identify the inclusion idea adopted from those teachers by using Index for Inclusion model (2014). With these purpose we have made a questionnaire (67 close questions and 4 open questions) which was submitted in a restrained situation to 68 teachers of 10 different preschool in the northern part of Italy (convenience sample). The present paper only focuses on open questions, examined with content analysis. Practice described by teachers were firstly analysed to point out which of the strategies identified by Mitchell are actually adopted in preschool and secondary to find out the specificity of inclusive teaching in that context. In particular it comes to light that three on four of Mitchell strategies' areas aren't reported by teachers like: cognitive strategies, behavioural strategies, assistive technologies and formative assessment strategies. But it emerges as relevant the area related to building a inclusive context and some preschool specificity like social skills training, relationship, dialogue, group work and some features that shows analogies with the UDL approach.

Is young children's self-regulation related to teachers' autonomy supportive style?

Keywords: Early childhood education, Metacognition, Primary education, Self-regulation

Presenting Author:Antonia Zachariou, University of Roehampton, United Kingdom; **Co-Author:**Arielle Bonneville-Roussy, Roehampton University, United Kingdom

Autonomy-supportive contexts are thought to promote students' self-regulation. However, research looking at this link in young learners is scarce, potentially due to the limitations of self-report measures. This study adopts a novel, observational approach, to investigate autonomy support from teachers and self-regulation from young pupils in the context of music lessons. The study aims to investigate whether autonomy supportive teaching styles are related to music pupils' self-regulation. This study takes a quantitative observational perspective. A sample of 30 music tutors and their 60 young pupils (aged 5-8) are video-recorded during a one-to-one music lesson. Autonomy support is coded on the basis of a measure inspired by Whipple, Bernier and Mageau's (2011) observational measure for maternal autonomy support. The self-regulation coding scheme identifies positive self-regulatory behaviours in music (Zachariou and Whitebread, 2015) and failures in self-regulation (Bryce and Whitebread, 2012). Preliminary results, so far, support the hypothesis that autonomy supportive teaching styles are positively related to young learners' levels of self-regulation during music lessons. Levels of teachers' autonomy support are positively related to children's positive self-regulatory behaviours ($r = .58, p < .05$), and negatively related to failures in self-regulation ($r = -.65, p < .01$). This study can support further research into learners' self-regulation and teachers' autonomy support and inform teaching practice.

Analyzing conditions of successful private tutoring with longitudinal data from Germany

Keywords: Secondary data analysis, Secondary education, Student learning, Teaching/instruction

Presenting Author:Karin Guill, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Melike Oemerogullari, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:**Olaf Koeller, Leibniz Institute for Science and Mathematics Education, Germany

In the past years, private tutoring has become very common around the world. In Germany, around 20 % of the secondary school students receive private tutoring. Generally, students and parents consider tutoring as an effective measure to improve academic performance. However, previous studies have come to different conclusions regarding the effectiveness of private tutoring. Most of these studies have focused on the effectiveness per se, but have not analyzed conditions of tutoring in much detail. In this study, we analyze the effects of private tutoring duration, intensity, tutoring content and motivation to receive tutoring on school achievement. Our analyses are based on longitudinal data conducted among secondary school students in Hamburg - Germany (N = 8732) and focus on the mainly tutored subjects mathematics and English. Missing values in the outcome variables and control variables were handled by multiple imputation. OLS-Regression analyses show no positive effects of the duration and different levels of intensity of private tutoring on school grades when controlling for prior knowledge, motivational and sociodemographic variables. Students who are tutored in mathematics for up to six months stay behind their non-tutored peers. Regarding the motivation for tutoring, we find no significant effects of extrinsic motivation for tutoring, i.e., parents initiate tutoring and consider it as necessary, nor of self-initiated tutoring on student's performance. We discuss our findings and the educational relevance of private tutoring for student's academic performance.

Session O 11

15 August 2019 12:00 - 13:30

Lecture Hall - H11

Single Paper

Cognitive Science, Learning and Instructional Technology

Cognitive Skills in Early Childhood Education

Keywords: Cognitive skills, Cooperative/collaborative learning, Design based research, Early childhood education, Educational technology, Language

(L1/Standard Language), Metacognition, Primary education, Reasoning, Science education

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Josef Guggemos, University St.Gallen , Switzerland

Robot intervention for promoting spatial relations and spatial language among preschool children

Keywords: Cognitive skills, Early childhood education, Educational technology, Language (L1/Standard Language)

Presenting Author: Sigal Eden, Bar-Ilan University, Israel; **Co-Author:** Einat Brainin, Bar-Ilan University, Israel; **Co-Author:** Adina Shamir, Bar-Ilan University, Israel

The purpose of the study was to examine the effect of an intervention using a bee-shaped robot (Bee-Bot) on the spatial thinking and spatial language (spatial relations, receptive vocabulary, expressive vocabulary) of preschool children. Eighty-four children ($M = 66.23$; $SD = 4.4$) participated in the study. The sample was randomly assigned to three groups: intervention with Bee-Bot, traditional intervention, and control group. Pre and post measures were conducted. The findings indicated that children exposed to the Bee-Bot intervention exhibited the greatest improvement in spatial relations and expressive vocabulary when compared to children who participated in the traditional intervention and control groups. The Bee-Bot activity made a unique contribution to spatial relations and expressive vocabulary. Implications for intervention programs will be discussed during the conference.

Using Storytelling to Scaffold Children's Cognitive Processing during Robotic Coding

Keywords: Cognitive skills, Educational technology, Metacognition, Primary education

Presenting Author: Brian Zoellner, University of North Florida, United States; **Co-Author:** Meghan Parkinson, University of North Florida, United States; **Co-Author:** Daniel Dinsmore, University of North Florida, United States; **Co-Author:** Kelli Lacefield, University of North Florida, United States

With little evidence about the cognitive, metacognitive, and motivational processes that young children employ during robotic coding and how these processes can be scaffolded, we set out to investigate how young children with little or no experience in robotic coding engaged in simple coding tasks. Additionally, we sought to better understand how narrative storytelling might scaffold those processes, and ultimately, performance outcomes in robotic coding. Twenty second-grade students from an ethnically diverse, lower socio-economic community participated in a coding activity using a Code-a-Pillar, a narrative text intervention using a familiar story – the “Three Little Pigs” – and then completed a more complex robotic coding task. While data collection and coding is ongoing, evidence from the study indicates that even sequencing code is not intuitive for young children with little no coding experience. Narrative story telling interventions hold much promise in scaffolding the development of the cognitive, metacognitive, and motivational processes necessary for successful coding outcomes.

Science competencies in elementary school. Does scientific thinking promote science understanding?

Keywords: Early childhood education, Primary education, Reasoning, Science education

Presenting Author: Susanne Koerber, University of Education Freiburg, Germany; **Co-Author:** Christopher Osterhaus, Ludwig-Maximilians-Universität, Germany

Scientific thinking and its relation with science understanding were investigated in a study with 227 six-year-olds in their last year of preschool. Sixty-six of the participants were followed throughout elementary school years. Using an instrument with 30 items, covering different aspects of scientific thinking, we found that kindergarteners possess broad emerging scientific-thinking abilities that go beyond competencies in a *single* task. Even at age six, early scientific thinking was predictive of children's competencies in science understanding (physics tasks on melting and evaporation) and to a lesser degree, in mathematics. This finding points to a specific relation between these two components of scientific literacy, and it supports the view that children's scientific-thinking abilities help them to better test and revise their (wrong) beliefs and misconceptions about science. Sixty-six children were followed longitudinally through grades 1, 2, 3, and 4 and analyses concerning the influence of scientific thinking on science understanding and vice versa are currently underway. Our study is the first to reveal broad individual differences in early scientific thinking, and it shows their impact on science learning, which exists even before children enter formal schooling and begin science education.

Practitioner's Perspective on Collaborative Learning among Young Children Using Mobile Technology

Keywords: Cooperative/collaborative learning, Design based research, Early childhood education, Educational technology

Presenting Author: Pinsuda Srisontisuk, Open University, United Kingdom

The intuitive nature of mobile touch screen technology such as iPads and other tablets along with the ease with which children are able to use the devices, means that it is important to investigate the role that teaching practitioners can play in maximising the effectiveness of this technology. Our research however, aims to report and document the attitudes and contributions of practitioners to facilitate the collaborative interaction of 3-5 year olds when using a creative mobile app (Our Story) on tablets. Data collection in this research includes detailed semi-structured interviews with 9 practitioners across different pre-school settings in the UK, with one school from a low SES area and the other school from a high SES area. The research examines what roles the practitioners believe they can play in designing m-learning activity, the reasons for these beliefs, the barriers to carrying out these roles, and the practical suggestions that emerge to promote collaborative learning with mobile technologies. These interviews are part of a design based-research project that recognizes the unique experience and expertise that early years practitioners have in working with young children. The two main research question that guided this study were (1) What are early years practitioners perspective on designing learning activities using mobile technology to promote collaborative learning? (2) Do variables such as years of teaching, catchment area, educational background influence early year's practitioners' perspective on m-learning in the early years?

Session O 12

15 August 2019 12:00 - 13:30

Seminar Room - S05

Single Paper

Cognitive Science, Instructional Design, Motivational, Social and Affective Processes

Metacognition and Self-regulation

Keywords: Assessment methods and tools, Cognitive skills, Early childhood education, Educational Psychology, Experimental studies, Instructional design, Intelligence, Metacognition, Self-efficacy, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Erik De Corte, KU LEUVEN, Belgium

Providing metacomprehension-ratings to support self-regulated learning with texts

Keywords: Experimental studies, Instructional design, Metacognition, Self-regulation

Presenting Author: Lenka Schnaubert, University of Duisburg-Essen, Germany; **Co-Author:** Leonie Kowalski, University of Duisburg-Essen, Germany; **Co-Author:** Daniel Bodemer, University of Duisburg-Essen, Germany

Metacognitive theories of self-regulated learning assume that learners use their monitoring outcomes to control study decisions. However, cognitive constraints may limit the learners' ability to utilize their monitoring judgments sufficiently during learning. Explicitly providing learners with their self-set monitoring judgments in the form of confidence ratings during re-study decisions has yielded promising results with regard to study regulation in the past. Thus, our study aims at investigating if this intervention also proves useful when targeting metacomprehension during learning from texts. In a between-subjects study ($N = 72$), we thus randomly assigned participants to one of two research conditions: with or without metacomprehension-ratings available during re-study decisions. Participants first read 12 short texts and were asked for a metacomprehension-rating after each one. They were then able to select texts for re-study purposes from a list. While deciding which texts to re-study, only participants in one experimental condition had their previously provided metacomprehension-ratings available. Afterwards, all participants re-studied the selected texts and performed a post-test to assess knowledge gain. Results indicate that the availability of self-set metacomprehension-ratings increases the usage of these ratings for study decisions. However, the link to knowledge gain was rather weak. While the latter

result warrants further research to improve the effectiveness with regard to learning outcomes, providing metacomprehension-ratings may be a useful asset for learners during self-regulated studying and could easily be implemented into educational practices, for example in electronic textbooks.

Building bridges to enhance young children's agency: Metacognition and executive function

Keywords: Assessment methods and tools, Early childhood education, Metacognition, Self-regulation

Presenting Author:Loren Marulis, Connecticut College, United States; **Co-Author:**Sara Baker, Faculty of Education, United Kingdom; **Co-Author:**David Whitebread, University of Cambridge, United Kingdom

Metacognition and executive function have evolved largely in parallel across disparate disciplines and limited empirical evidence—particularly in early childhood—exists integrating the two constructs. However, theories of both indicate regulation of lower-order processes providing greater flexibility to cognition and behavior by increasing focus on understanding one's learning and self-regulatory agency over habitual reactions to the environment and automaticity. Furthermore, considerable research implicates both metacognition and executive function as important processes for positive outcomes including academic achievement and learning. In the current paper, we review extant associations between early metacognition and executive function and explore factors that affect and enhance both skills with the purpose of informing young children's ability to be active agents of their own learning and development. In addition, we argue that metacognition and executive function interventions can provide pertinent and important evidence regarding the development of agency. Specifically, we propose that by integrating metacognition and executive function in developmental theory, research, instruction, and interventions, bridges can be created to support children's agency toward their own learning. To this end, ways to study and integrate these skills are suggested, with an emphasis on how researchers and practitioners can bring metacognition and executive function together—in early childhood—to enhance agency and contribute to theory and practice across disciplinary boundaries.

Does Measuring Metacognition Improve Performance?

Keywords: Intelligence, Metacognition, Self-efficacy, Self-regulation

Presenting Author:Kit Double, University of Oxford, United Kingdom; **Co-Author:**Damian Birney, University of Sydney, Australia

Educators have often been encouraged to introduce metacognitive prompts into classroom environments in order to enhance learning. One commonplace metacognitive prompt is a confidence rating. Confidence ratings have often been integrated into reasoning and intelligence tasks as a means for assessing metacognitive processes. It is often assumed that eliciting these judgements does not influence participants' underlying cognitive performance, however, if providing confidence ratings facilitates performance, then they may be a relatively simple addition to the classroom. The current set of studies examines whether eliciting confidence ratings from participants during a reasoning tasks influences their performance and how this effect is moderated by participants' pre-existing self-confidence in their own reasoning abilities. I will present data from four experiments that suggests that the effect of confidence ratings interacts with pre-existing self-confidence and this effect is driven by priming participants' pre-existing self-confidence, rather than enhancing their metacognitive monitoring. Implications for the measurement of metacognition and the use of confidence ratings as an educational intervention are discussed.

Assessing the relationships between metacognition, mind wandering and mindfulness: A pilot study

Keywords: Cognitive skills, Educational Psychology, Metacognition, Self-regulation

Presenting Author:David Preiss, Pontificia Universidad Catolica de Chile, Chile; **Co-Author:**Valeska Grau, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Miguel Ibaceta, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**David Torres, Pontificia Universidad Católica de Chile, Chile

We present the results of a pilot study whose goal was to create four Spanish based scales of mind wandering (intentional positive, intentional negative, spontaneous positive, spontaneous negative) in order to assess its relationship with mindfulness as well as metacognition. 305 university students took the four scales of mindwandering whose items were specially created for this pilot. They also took the Five Facet Mindfulness Questionnaire (FFMQ), which has been validated for Chile and includes five subscales: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Finally, they took a self-report scale taken from the Goal Orientation and Learning Strategies Survey, which evaluates use of metacognitive strategies (Dowson & McInerney, 2004). Reliability of the different scales was all acceptable. Inspection of the correlation table between variables showed significant positive correlations between the mind wandering scales depending on the emotional valence of the items. The correlations between the negative and positive scales of spontaneous mind wandering and the negative and positive scales of deliberate mind wandering were negative and low. As regards the correlations between these scales and the FACETS scales showed the following patterns: deliberate and spontaneous positive mind wandering correlated positively with all the Facets subscales but Act with Awareness; deliberate and spontaneous negative mind wandering correlated negatively with all the Facets subscales but with Observe. As regards the relationships with metacognition, we performed a hierarchical multiple regression analyses predicting the Metacognition score. Metacognition was only predicted significantly by the scales of acting with awareness and non-judging of inner experience.

Session O 13

15 August 2019 12:00 - 13:30

Seminar Room - S13

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Workplace Learning

Keywords: Attitudes and beliefs, Collaborative Learning, Content analysis, Higher education, Pre-service teacher education, Qualitative methods, Reflection, Teacher professional development, Vocational education, Workplace learning

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Lais Oliveira Leite, University of Eastern Finland, Finland

Hierarchy - Barrier or Opportunity for Team Learning?

Keywords: Collaborative Learning, Content analysis, Qualitative methods, Workplace learning

Presenting Author:Therese Grohnert, Maastricht University, Netherlands; **Co-Author:**Pleunie Simons, Maastricht University, Netherlands; **Co-Author:**Roger Meuwissen, Maastricht University, Netherlands; **Co-Author:**Wim Gijsselaers, Maastricht University, Netherlands

How can team learning be facilitated in strictly hierarchical teams? Specifically, how can sharing information and decision-making be facilitated across hierarchical levels? Combining insights from team learning, organizational behavior, and management research, we explore how team learning can be fostered in hierarchical teams that face complex, unpredictable tasks. Through 42 interviews with audit professionals across hierarchical levels, we explore in-depth which conditions foster team learning across hierarchical levels, given auditors' work in strict hierarchies with high task structure, yet changing task characteristics. First, we explore overall conditions for enabling team learning in hierarchical teams. Second, we parse differences in these relationships between different hierarchical levels. Results show that hierarchy can be perceived as a barrier to team learning and even as a source of pressure unless especially lower hierarchical levels perceive psychological safety and inviting leader behavior. Time pressure and low staffing levels may, however, mitigate these positive effects. Exploring these differences between hierarchical levels affords two main opportunities: extending models of team learning antecedents by specifying sub-models by levels, and generating practical implications for each level in turn.

Pain in present gain in future: How professionals learn from self-made errors

Keywords: Content analysis, Qualitative methods, Reflection, Workplace learning

Presenting Author:Laura Smeets, Maastricht University, Netherlands; **Co-Author:**Wim Gijsselaers, Maastricht University, Netherlands; **Co-Author:**Therese Grohnert, Maastricht University, Netherlands; **Co-Author:**Roger Meuwissen, Maastricht University School of Business and Economics, Netherlands

Pain in present gain in future: How professionals learn from self-made errors Learning from self-made errors is vital for career development and success. Yet, it appears that learning from errors does not take place automatically. This study explores in detail what drives professionals across hierarchical levels to engage

in learning from errors, and specifically, which strategies are chosen given organizational conditions.

Semi-structured interviews were conducted with twenty-four professionals, working in the domain of auditing. First analysis of data shows that a variety of circumstances seem to hinder professionals in learning from their errors including; a lack of guidance by supervisor, a lack of time and a lack of performance feedback by the supervisor. This study contributes to existing literature through its focus on identifying organizational conditions that enable professionals to learn from self-made errors after a fix quick of the error situation.

Changes in learning-to-teach patterns of student teachers during internships: An LTA approach

Keywords: Attitudes and beliefs, Higher education, Pre-service teacher education, Workplace learning

Presenting Author:Michael Goller, University of Bamberg, Germany; **Presenting Author:**Dagmar Festner, University of Paderborn, Germany; **Co-Author:**Alexander Groeschner, Friedrich Schiller University Jena, Germany; **Co-Author:**Tina Hascher, University of Bern, Switzerland

Student teachers (ST) differ in their approach on how they learn to teach from practice experiences. These different approaches can be summarised in so called learning-to-teach patterns (Oosterheert, 2001). Although empirical evidence exists that such patterns are subject to change due to significant learning experiences during internships it is still not clear why these changes occur. In addition, it is still unclear why these changes occur in various directions and whether occurring changes are related to learning outcomes. Based on previous studies it is hypothesised that (a) ST change more often into desirable learning patterns as long as they are professionally guided during their internships and that (b) ST that change into a more desirable pattern (or stay within it) learn more during their internships than ST that change into less desirable patterns (or stay within them). These hypotheses were investigated with a sample of German ST ($n=512$) doing a five-month internship. A longitudinal study design with two measurement-points was employed and a latent transition analysis approach was used to analyse the data. Results revealed three learning patterns: Versatile (desirable pattern), Practice-orientated, and Avoidant (less desirable). ST who showed desirable patterns in t_2 and those that changed into desirable patterns during their internship significantly developed more competences than ST in undesirable patterns or students that changed into undesired directions.

Reflection in professional contexts – views of teachers in vocational education and training

Keywords: Qualitative methods, Teacher professional development, Vocational education, Workplace learning

Presenting Author:Baerbel Fuerstenau, TU Dresden, Germany; **Presenting Author:**Mandy Hommel, TU Dresden, Germany; **Presenting Author:**Regina Mulder, University of Regensburg, Germany

Reflection contributes to professional development of teachers. Reflection helps to take informed actions, to break routines, and to improve instruction. Thus, reflection can be regarded a prerequisite for successful instruction. Against this background, our research aimed at developing a framework and at analyzing teachers' views on reflection. Their views explain and guide reflection behavior which in turn explains and guides professional actions. We conducted in-depths interviews with teachers of vocational schools ($N = 26$) in Germany. The interview guideline is based on the reflection framework. Data was analyzed using a content analysis. The results reveal input, process, and outcome factors of reflection. Among others, teachers report, that they judge reflection very important for their professional and personal development, and that they usually do not have enough time to reflect due to high workload. The results reveal points of reference to promote reflection, and thus professional actions.

Session O 14

15 August 2019 12:00 - 13:30

Lecture Hall - H05

Single Paper

Teaching and Teacher Education

In-service Teacher Education and Teacher Professional Development

Keywords: Educational technology, In-service teacher education, Inquiry learning, Knowledge creation, Motivation, Reflection, Science education, Teacher professional development, Technology

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Barbara Otto, University of Landau, Germany

Media literacy of teachers and technology equals high-quality teaching in classrooms?

Keywords: Educational technology, In-service teacher education, Teacher professional development, Technology

Presenting Author:Michael Sailer, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Julia Murböck, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

This survey of $N = 410$ German in-service secondary school teachers assessed (1) how technology-related school equipment, (2) how teachers' personal media literacy, (3) technological pedagogical content knowledge, and (4) technology-related teaching skills relate to the quality of technology usage in classrooms. This quality was assessed by self-estimations of teachers about their students' learning activities. Those activities were categorized as passive, active, constructive, and interactive (Chi & Wylie, 2014). Structural equation modelling was applied to investigate the research question. Results show that technology-related school equipment was not associated with the quality of technology usage. Teachers' personal media literacy does relate to passive, active, and interactive technology usage. Technological pedagogical content knowledge was not related to the quality of technology usage. Technology-related teaching skills relate to passive, constructive, and interactive technology usage. In conclusion, media literacy and technology-related teaching skills are important factors contributing to technology usage in classrooms with technology-related teaching skills being most important for high-quality technology usage in the classroom. Thus, fostering technology-related teaching skills in pre- and in-service teachers is essential to ensure technology usage that evokes high-quality learning activities of teacher students.

Teacher Reflection and Motivation

Keywords: In-service teacher education, Motivation, Reflection, Teacher professional development

Presenting Author:Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel; **Co-Author:**Yael Mishaëli, Ben Gurion University of the Negev, Israel; **Co-Author:**Guy Roth, Ben-Gurion University of the Negev, Israel

The value of reflection for teacher professional development and the challenges of promoting it have been extensively discussed and demonstrated. However, there is relatively little empirical evidence demonstrating the challenges and benefits of increasing teacher reflection in terms of supporting basic psychological needs and quality of motivation. Employing self-determination theory, we tested the hypothesis that support of teachers' need for relatedness, competence and autonomy, from moderators of collaborative reflection meetings, predicts increased reflectivity, which, in turn, predicts enhancement of autonomous motivation and sense of self-accomplishment in teaching. We collected beginning and end-of-year survey data from 83 Israeli teachers participating in a program designed to promote collaborative reflective inquiry of problems of practice. Structural equation modeling analysis supports our hypothesis, even when controlling for initial autonomous motivation and self-accomplishment. This study advances our understanding of the challenges and benefits of in-service teacher reflection, suggesting ways to support teacher collaborative reflection and enhance professional motivation and well-being.

A Comparison of Experienced and New Facilitators of Structured Professional Development in Science

Keywords: In-service teacher education, Inquiry learning, Science education, Teacher professional development

Presenting Author:Judith Warren Little, University of California, Berkeley, United States; **Co-Author:**Elena Duran Lopez, University of California Berkeley, United States; **Co-Author:**Anna Weltman, University of California Berkeley, United States

A large body of research illuminates the nature and importance of teachers' subject teaching knowledge and demonstrates growth in that knowledge through participation in professional development programs (Borko, 2004; Desimone, 2009). However, we have lacked a corresponding body of research focused on two central questions: (1) What do professional development facilitators *do* to cultivate the kind of teaching knowledge, practice, and dispositions that will result in

student learning of complex subject matter; and (2) how might effective programs of professional development be expanded in their reach through the preparation and support of facilitators recruited in local communities? This paper contributes to an emerging body of research on these questions by comparing the practices of experienced and newly selected facilitators in the context of moderately structured, inquiry-oriented science PD. Analysis concentrates on video records of PD implementation in three expert-led PD courses and six courses led by newly trained local PD facilitators, supplemented by facilitator surveys, facilitator interviews, and video records of facilitator training. The moderately structured nature of the PD, together with facilitator training and associated material resources, enabled new facilitators to preserve the intended inquiry-oriented PD design. However, analysis revealed variations in key aspects of facilitation of whole-group discussion, with implications for facilitator training and support.

Teachers in Estonia: Low motivation is more critical than low general pedagogical knowledge

Keywords: In-service teacher education, Knowledge creation, Motivation, Teacher professional development

Presenting Author: Äli Leijen, University of Tartu, Estonia; **Co-Author:** Liina Malva, University of Tartu, Estonia; **Co-Author:** Katrin Poom-Valickis, Tallinn University, Estonia; **Co-Author:** Margus Pedaste, University of Tartu, Estonia; **Co-Author:** Aleksander Bauca, University of Belgrade, Serbia

The main goal of the paper is to identify different types of in-service teachers based on their general pedagogical knowledge (GPK) and motivation and to explore potential differences among these types regarding to the teaching quality, the persistence in teaching, and interest in the professional development. A group of 142 Estonian in-service subject teachers (science, mathematics or mother tongue) from lower secondary education were included in the study. Based on the cluster analysis four types of in-service teachers were identified: (a) teachers with average motivation and low GPK – 14%, (b) teachers with high motivation and GPK – 27% (c) teachers with average motivation and GPK – 46%, and (d) teachers with low motivation and average GPK. These four types of in-service teachers were significantly different in terms of teacher quality, persistence in teaching, and interest in professional development. These findings suggest that both formal knowledge and motivational dispositions are important characteristics of successful functioning in the workplace. They also suggest that low motivation for teacher profession has a stronger negative effect than low level of general pedagogical knowledge. In-service teachers who have a lower level of motivational disposition for teacher profession were significantly lower on teaching quality and interest in professional development. These findings have implications for both initial, pre-service education and in-service teacher professional development.

Session O 15

15 August 2019 12:00 - 13:30

Seminar Room - S03

Single Paper

Cognitive Science, Learning and Instructional Technology, Motivational, Social and Affective Processes

Science Education

Keywords: Argumentation, Attitudes and beliefs, Case studies, Cognitive development, Cognitive skills, In-service teacher education, Metacognition, Out-of-school learning, Primary education, Science education, Technology

Interest group: SIG 03 - Conceptual Change, SIG 08 - Motivation and Emotion, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Peter David Renshaw, The University of Queensland, Australia

Latent Profiles of Elementary School Student's Epistemic Beliefs in Science

Keywords: Attitudes and beliefs, Cognitive development, Primary education, Science education

Presenting Author: Julia Schiefer, University of Tuebingen, Germany; **Co-Author:** Andrea Bernholt, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:** Nele Kampa, Leibniz Institute for Science and Mathematics Education (IPN), Germany

Epistemic beliefs (EB) are a central theme in educational research and considered particularly important for student's learning as early as at the elementary school level. In the assessment of EB in science, self-report questionnaires primarily used focus on the four relevant dimensions source, certainty, development, and justification of knowledge. Going beyond measuring EB population means, recent research has focused on a person-centered approach, which investigates EB via latent profile analyses (LPA). In the present study, we explored the number and characteristics of science EB profiles among $N = 680$ third and fourth grade students, an age group that has been neglected in LPA so far. We identified three science EB groups that show level and shape differences, a first group with *intermediate* science EBs, a second group that showed *evidence-based/dynamic* science EB, and a third group of students with *sophisticated* beliefs. These groups differed considerably regarding constructs related to students' learning, namely science achievement, motivational dispositions as well as social background. The results indicate that already young children develop different science EB nuances represented by different profiles.

Develop student scientific argumentation via metacognitive scaffolding

Keywords: Argumentation, Case studies, Metacognition, Science education

Presenting Author: Qingna Jin, University of Alberta, Canada

Scientific argumentation has been supported as a fruitful approach to engage students in meaningful science learning. However, the process of students' argumentative practice has been fully clear, as argumentation is usually understood only as a cognitive skill or a set of skills. Understanding argumentation as both a cognitively demanding task (including both the cognitive level and the metacognitive level) and a form of social practice, this study was particularly focusing on the process of argumentation, that is, exploring how students learn and participate in argumentation. This study, framed as a qualitative case study, was conducted in a Grade 5-6 science classroom. 21 students participated in argument-related activities (i.e., argument construction and argument evaluation) integrated into their everyday classroom science teaching and learning for 12 weeks. During the research period, the science teacher provided some metacognitive scaffolds whenever she thought appropriate. Various methods, such as classroom observation, think-aloud strategy and interviews, were employed to collect relevant data. Through qualitatively analyzing the data, we found teacher's argument-focused metacognitive scaffolds helped students constructed their metacognitive knowledge specific to argumentation, which informed their argument construction and argument evaluation significantly.

Longitudinal study of the primary students' Topic Specific Science related ability beliefs

Keywords: Attitudes and beliefs, Primary education, Science education, Technology

Presenting Author: Kalle Juuti, University of Helsinki, Finland; **Co-Author:** Anni Loukomies, University of Helsinki, Finland; **Co-Author:** Jari Lavonen, University of Helsinki, Finland; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland

In this research, we examined the development of students' science and technology related ability beliefs within grades one to three (students age 7 to 9). Students in one school participated every year in a set of three science and technology workshops as an experiment group. Workshops included electric circuits and handicraft tasks, programming with Lego Mindstorm robots, and computer based data logging. Altogether, 62 Finnish students participated in the workshops while 44 students in other schools served as a control group. Students' topic specific ability beliefs were measured before and after the workshops. Topics were e.g. programming robots and measuring temperature. Ability belief mean value comparison in each time-point showed that with workshops it is possible to increase students' ability beliefs.

Examining the relationship between learners' observation and knowledge structures in field geology

Keywords: Cognitive skills, In-service teacher education, Out-of-school learning, Science education

Presenting Author: Lauren Barth-Cohen, University of Utah, United States; **Co-Author:** Sarah K. Braden, Sarah K. Braden School of Teacher Education and Leadership Utah State University, United States

Scientific observation is central to classroom inquiry, yet learners often struggle with observing unfamiliar phenomena. Comparably, professional scientists engage in complex observations that are tightly connected to their disciplinary expertise. However, little is known about the relationship between knowledge and observation as a potential locus of learning. Furthermore, in school science, observations are often viewed as a challenge to overcome, not a learning

opportunity. To conceptualize this learning progression and potential challenges, we start from the conceptual change theoretical framework of Knowledge-in-Pieces. This framework is used to examine the structures of learners' knowledge systems as they observed rock outcroppings and used their prior knowledge to connect those observations to the geologic history. Data comes from audio records of secondary science teachers' conversations during a professional development workshop focused on field geology. The learners worked to generate observations of various geological phenomena and connect those observations with geological principles and historical processes. From the analysis we document a non-linear relationship between the quantity and relevance of the observations made by participants and the level of structure of their localized knowledge systems. Implications address the design of learning opportunities for fostering scientific observation skills in field settings.

Session O 16

15 August 2019 12:00 - 13:30

Seminar Room - S10

Single Paper

Culture, Morality, Religion and Education, Higher Education

Educational Theory and Philosophy

Keywords: Conceptual change, Culture, Design based research, Knowledge creation, Lifelong learning, Philosophy, Qualitative methods, Researcher education, Science education, Values education

Interest group: SIG 25 - Educational Theory

Chairperson: Franziska Vogt, University of Teacher Education St.Gallen, Switzerland

What is an educational theory?

Keywords: Conceptual change, Knowledge creation, Philosophy, Researcher education

Presenting Author: Cristian Simoni, University of Padua, Italy

The question posed in the title aims to rediscover the importance of offering arguments in order to justify the use of expressions as 'educational theory' as well as other locutions as 'education theories', 'theories on education', 'learning theories' or 'pedagogical theory'. The problem raised doesn't refer to a mere linguistic attempt to create a common vocabulary, shared by researchers coming from different research fields. In fact, clarifying and not taking for granted the use of these 'labels' means also to deal with both epistemological issues and questions related with the problem of our educational cultural heritage. Thus, the first part of the paper is dedicated to call into question the use of the adjective 'educational', in order to qualify a theory concerning education. Then, I examine more in depth the epistemological implications and I submit the existence of three different kinds of theories, able to respond to three likewise different kinds of interrogatives concerning education. The framework presented has been elaborated after I've reflected on the Aristotelian one, regarding the threefold human rationality: the theoretical (or scientific), the practical (or moral) and the productive (or technical) one. The last reflection is about the relationship between the researcher (that expresses curiosity and doubts regarding our present) and the past of the cultural heritage, represented by different theories of education coming from social sciences and philosophy.

Transformation of subject knowledge between lectures, lab exercises and report writing

Keywords: Design based research, Philosophy, Qualitative methods, Science education

Presenting Author: Niels Dohn, Aarhus University, Denmark; **Co-Author:** Nina Bonderup Dohn, University of Southern Denmark, Denmark

This paper reports on a design experiment at a University Physics Education (UPE). The design experiment utilized a design-based research methodology. It takes its outset in a combination of experienced practice problems and a research question, investigated through the design experiment. The practice problems concern the 'cook-book' laboratory activities at UPE: Students appeared to pass the BA program with a minimum of laboratory skills; without understanding the role of experiments in scientific inquiry; and without developing the deeper understanding of the theoretical concepts that the laboratory activities were supposed to foster. These problems correspond to issues reported in the science education literature. The problems led faculty to develop *Experimental Physics* as an independent, inquiry-based course. The theoretical outset for the study is a sociocultural understanding of learning subject knowledge. 5 knowledge forms are distinguished utilizing Dohn's philosophical framework. The research question was: *Which knowledge forms does the learning design support the development of, and how are knowledge forms transformed between lectures, laboratory setting and report writing?* The study utilized a multimethod qualitative design. Five forms of data were collected in both cook-book course (175 students) and inquiry-based course (107 students): classroom observations, informal interviews, open-ended questionnaire, lab manuals, and students' lab reports. Findings show that the cook-book design only supported some knowledge forms whereas the inquiry-based design supported all knowledge forms and the transformation of propositional knowledge from lectures. However, students did not fully take up the learning opportunities. Therefore, knowledge development was not as extensive as faculty intended.

Education in a Leisure-Based Jobless Society

Keywords: Culture, Lifelong learning, Philosophy, Values education

Presenting Author: Eugene Matusov, University of Delaware, United States

In this theoretical paper, I present a possible outlook for education in a leisure-based jobless society involving technological unemployment and universal basic income. I argue that education might involve a hybrid of instrumental and intrinsic types with intrinsic education being dominant. Intrinsic education is essentially a form of leisure because it is rooted in self-actualization. In itself, leisurely intrinsic education may consist of open socialization in a targeted practice based on promoting creative authorship and of examination of the life, self, society, world; and education itself embedded in a critical dialogue promoting critical authorship. I will discuss, exemplify, and problematize these diverse types of education in a future leisure-based jobless society.

Session O 17

15 August 2019 12:00 - 13:30

Seminar Room - S07

Single Paper

Teaching and Teacher Education

Pre-Service Teacher Education

Keywords: Assessment methods and tools, Case studies, Competencies, Content analysis, Cooperative/collaborative learning, Design based research, Pre-service teacher education, Quantitative methods, Self-regulation, Teacher professional development, Teaching/instruction, Technology

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Els Boshuizen, Open University of the Netherlands, Netherlands

Preparing teachers for the 21st century practice: A longitudinal study

Keywords: Cooperative/collaborative learning, Pre-service teacher education, Self-regulation, Technology

Presenting Author: Kati Mäkitalo, University of Oulu, Finland; **Co-Author:** Päivi Häkkinen, University of Jyväskylä, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Arto K. Ahonen, University of Jyväskylä, Finland; **Co-Author:** Jari Kukkonen, University of Eastern Finland, Finland; **Co-Author:** Piia Naykki, University of Oulu, Finland; **Co-Author:** Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:** Erkkö Sointu, University of Eastern Finland, Finland; **Co-Author:** Teemu Valtonen, University of Eastern Finland, Finland; **Co-Author:** Anne Virtanen, University of Jyväskylä, Finland

In this paper, we report the results on our longitudinal study where students were followed for three years during bachelor level teacher education studies. The aim was to find out on how the students' 21st century skills are developing, such as strategical learning, collaboration dispositions as well as use of ICT in

education and attitudes towards the use of ICT. Students' perceptions of their 21st century skills were measured three times during their bachelor studies. At the first-year measurement point students reported their skills rather positively perceiving their strategic learning skills and collaboration dispositions as high. Students' perception as skillful learners was remaining at the same level for three years. However, the students reported possessing lower dispositions towards collaboration and teamwork. Skills for using ICT in education were perceived rather low, which shows an increase during their studies. Since less than 12% of applicants are accepted to teacher education in Finland, this is partly explaining their perception as skillful learners. In conclusion we discuss how our results can widen our understanding about the development of teacher education.

Measuring Lesson Planning Competency: Scale Development and Validation

Keywords: Assessment methods and tools, Competencies, Pre-service teacher education, Quantitative methods

Presenting Author:Olga Chernikova, Ludwig Maximilian University, Germany; **Co-Author:**Karsten Stegmann, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Jan-Willem Strijbos, University of Groningen, Netherlands; **Co-Author:**Tina Seidel, Technische Universität München, Germany

The current study presents the development of a measurement scale aimed at overcoming the uncertainty principle of current research in competence measurement and facilitation. More specifically, the developed scale allow to assess the gain in lesson planning competency at several time points and in this way assess the effectiveness of the instruction. The study contributes to the theoretical knowledge base about competence structure and development, but also to practical decisions about the design and effectiveness of assessment of learning environments. The assessment is based on observing exemplary videos of lessons in the domain of physical education. We defined and operationalized lesson planning competency within the professional vision framework as a unidimensional construct, where items with increasing difficulty represent different processes (noticing, explanation, prediction). The scale was developed using the Rasch approach and validated on two cohorts of pre-service elementary school teachers (N = 178). The scale development and validation resulted in two sensitive and comparable scales (EAP & WLE reliability > .65), which can be used for pre- and post-test lesson planning competency assessment in elementary school pre-service teachers in the physical education domain. Moreover, the procedure and principles described in the method section can be applied to different domains and levels of teaching competency.

Group concept mapping as starting point for educational design research in primary education

Keywords: Case studies, Design based research, Pre-service teacher education, Teacher professional development

Presenting Author:Iwan Wopereis, Open University of the Netherlands, Netherlands; **Co-Author:**Emmy Vrieling, Open University of the Netherlands, Netherlands; **Co-Author:**Marjon De Boer-Bruggink, Iselinge Hogeschool, Netherlands; **Co-Author:**Slavi Stoyanov, Open University of the Netherlands, Netherlands

In this study we investigated the question whether Trochim's Group Concept Mapping (GCM) is a useful method for creating a shared mental model of themes that are central to educational design research (EDR) projects in which students, teachers, teacher educators and researchers participate. In a multiple case study carried out in primary education, processes, products, and application of the GCM method were investigated in three EDR projects. Results of analyses of transcriptions of group discussions (focus: the GCM process), concept maps (focus: the GCM product) and chosen problem definitions (focus: the GCM application) show that the shared mental models that emerged from GCM were useful for problem selection and analysis in the initial phase of these two-year projects.

Exploring Pre-Service Teachers' Professional Vision in the Context of Lesson Planning

Keywords: Case studies, Content analysis, Pre-service teacher education, Teaching/instruction

Presenting Author:Adriana Zaragoza, Technische Universität München, Germany; **Co-Author:**Martina Alles, Technische Universität München (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

University-based teacher programs face the challenge of preparing prospective teachers for the professional practice (Grossman et al., 2009). In order to facilitate knowledge transfer into teaching practice, pre-service teachers need to consciously apply their professional knowledge during lesson planning (LP) by formulating predictions about the expected learning effects of their planned activities upon students' thinking and justifying them with arguments based on teaching and learning principles (Hiebert, Morris, Berk, & Jansen, 2007; Stender, 2014). Based on these considerations, a new LP template was implemented in a teacher training program in order to examine to what extent pre-service teachers were able to formulate predictions and justify them by drawing on professional knowledge. By means of case analysis, the development of interest in teaching and learning as well as in teacher's professional vision (PV) skills during the first study year was explored, focusing on pre-service teachers with either the two best or the two worst lesson plans after one year. A wide range was found in the quality of the predictions and justifications: From pre-service teachers that could not formulate any correct prediction and justified them with overgeneralizing arguments until those ones that formulated several correct predictions, justified them in detail and supported their arguments with references. Further, at the end of the first study year, pre-service teachers with the best lesson plans showed a higher PV and interest in courses on pedagogical content knowledge, than those ones with the worst lesson plans.

Session O 18

15 August 2019 12:00 - 13:30

Seminar Room - S01

Single Paper

Assessment and Evaluation, Educational Policy and Systems

Educational Policy

Keywords: Achievement, Assessment methods and tools, Educational attainment, Educational policy, Meta-analysis, Mixed-method research, Primary education, School effectiveness, Secondary data analysis

Interest group: SIG 18 - Educational Effectiveness, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Jessica Summers, University of Arizona, United States

School principals' work-related stress and coping strategies

Keywords: Educational attainment, Educational policy, Primary education, School effectiveness

Presenting Author:Mailis Elomaa, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Sirpa Eskelä-Haapanen, University of Jyväskylä, Finland; **Co-Author:**Leena Halttunen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

More than ever before, school principals face stress and burnout, resulting from increasing role demands and decreasing decision latitude and autonomy (Darmody & Smyth, 2004). In order to understand how principals perceive their work and how to best support them, research on their experiences on stress factors and coping is needed. The aim of the present study is to examine what causes stress to principals and what are their coping strategies. In addition, factors associated with their work-related stress, coping strategies and the support they need are investigated. Thirty-six primary school principals from larger follow-up study Teacher and Student Stress and Interaction in Classroom (TESSI) answered to the questionnaires Open-ended question were analysed by using problem-driven content analysis with abductive reasoning. The results indicated not having enough time, the amount of work, leading others and leading change to be the main stressors for principals. In turn, physical activity, rest, work management and social support were the most used coping strategies with stress. Principals feel that they need more social support, knowledge and time to cope with their leadership.

Value-added modeling in primary school: What covariates to include ?

Keywords: Achievement, Educational policy, School effectiveness, Secondary data analysis

Presenting Author:Jessica Levy, University of Luxembourg, Luxembourg; **Co-Author:**Martin Brunner, University of Luxembourg, Luxembourg; **Co-**

Author:Ulrich Keller, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg; **Co-Author:**Antoine Fischbach, University of Luxembourg, Faculty of Language and Literature, Humanities, Arts and Educational Sciences (FLSHASE), Luxembourg

Value-added (VA) modeling aims to quantify the effect of pedagogical actions on students' achievement, independent of students' backgrounds. There seems to be a lack of consensus and consistency concerning the inclusion and exclusion of covariates when calculating VA scores. The present study thus aims to conduct a systematic analysis and comparison of a large set of combinations of covariates in school VA models. Regarding the increasing diversity in student populations in many countries, leveling out the influence of students' backgrounds, and thus the exploration of school VA models becomes increasingly important. Given the fact that the school context in Luxembourg is already highly diverse and multilingual, data from large-scale standardized achievement tests of the Luxembourg school monitoring programme seem appropriate for the systematic comparison of school VA models. First findings indicate the importance of not only taking into account prior achievement in math when calculating school VA scores in math, but also prior language achievement and the socioeconomic background of the students, which is especially relevant given the high student diversity.

School inspection: Is it worth the effort? A systematic review of 30 years of international research

Keywords: Assessment methods and tools, Educational policy, Meta-analysis, School effectiveness

Presenting Author:Sarah Isabelle Hofer, TU Munich School of Education, Germany

Regular evaluation by external authorities has become integral part of school life in countries around the world. While the potential of frequent quality monitoring and feedback is undisputed, the evidence base on the effectiveness of school inspection is scattered. The present study classified and summarized research on school inspection effects of the last 30 years to (1) provide an assessment of the effectiveness of school inspection and (2) identify factors influencing inspection effects. Following a systematic and comprehensive literature search, a total number of $k=35$ quantitative studies on inspection were categorized by inspection system, research design, and by outcome. Whereas the effects reported in the most rigorous studies (i.e., with control group design) were summarized based on the direction of the effect, the findings of pre-post-inspection, correlational, and comparison group studies that investigated inspection effects under different conditions and in different contexts without control groups were synthesized qualitatively. Forty-eight of the $n=222$ effects of the $k=15$ most rigorous studies indicated positive inspection effects. The majority of effects, $n=135$, was not significant. When calculating the means of the proportions of positive, negative, and non-significant effects per study, however, on the average 19% of the effects per study were positive, 30% were negative, and 50% were non-significant effects. Clear communication of expectations and the perceived quality of the inspection process were two of several factors that may influence inspection success. The findings of this systematic review highlight new avenues for school evaluation research and practice.

'Intractable' schools: can an Ofsted classification prevent sustainable improvement?

Keywords: Achievement, Educational policy, Mixed-method research, School effectiveness

Presenting Author:Bernardita Munoz Chereau, University College London, United Kingdom; **Co-Author:**Melanie Ehren, UCL Institute of Education, United Kingdom

Schools in England are held accountable for a variety of aspects of their performance. Ofsted (Office for Standards in Education) judges schools' quality, using national test and examination results and these results inform league tables which are published by the Department for Education. Ofsted classifies schools on a four-point scale and those with a failing inspection outcome are expected to improve. However, a small number of schools named 'intractable' by Her Majesty's Chief Inspector (HMCI) have been classified as less than good consistently since 2005 (Ofsted, 2017) without this classification leading to improvement of these schools. On the contrary, it may even have acted as a barrier for change. The study aims to investigate 1) the characteristics of these 'intractable' schools, and 2) why the Ofsted classification has not led to improvement in these schools. Our study builds on existing work in the area, such as research by the Education Policy Institute which found a negative correlation between schools with a disadvantaged intake and low prior attainment and a favourable Ofsted judgement (Hutchinson, 2016), and wider work looking at effects of school inspections (Ehren and Shackleton, 2016). We will implement an exploratory mixed-method study starting with work using available quantitative data to identify characteristics and patterns of change in these schools. We will then select ten schools to study identified characteristics and patterns in more detail. Our findings will inform policy makers, researchers and practitioners about how inspections of these schools can more effectively achieve their aims.

Session O 19

15 August 2019 12:00 - 13:30

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Single Paper

Assessment and Evaluation, Instructional Design, Teaching and Teacher Education

Student Learning

Keywords: Collaborative Learning, Comprehension of text and graphics, Pre-service teacher education, Primary education, Quantitative methods, Quasi-experimental research, Reading comprehension, Science education, Student learning, Teacher professional development, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 02 - Comprehension of Text and Graphics, SIG 11 - Teaching and Teacher Education

Chairperson: Martine Baars, Erasmus University Rotterdam, Netherlands

Investigating differentiated instruction in a text-learning strategy intervention with mind maps

Keywords: Comprehension of text and graphics, Primary education, Quasi-experimental research, Student learning

Presenting Author:Rielke Bogaert, Ghent University, Belgium; **Co-Author:**Emmelien Merchie, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium

Students need effective strategies for text-based learning to deal with the emergent information flow in our current society. Prior research has shown the beneficial effect of mind maps to support learners in this text-based learning. However, not all learners are alike in their need for instruction in this respect, making differentiated instruction required. Therefore, this study examines the occurrence of differentiated instruction in a text-learning strategy intervention with mind maps in fifth and sixth grade classes. A quasi-experimental pretest-posttest design was set up, with one experimental and one control condition. 187 students from 9 different elementary classes participated. Data were collected by means of a self-report questionnaire, trace methodology, and class observations. The results show that students' characteristics such as learning disability and home language are related to their text-learning strategy use in the experimental condition. Furthermore, the results indicate that the degree of differentiated instruction is positively related to the quality of students' traces and some (meta)cognitive strategies they use. Based on these findings, implications, limitations, and suggestions for future research are discussed.

Profiles of instructional quality in classes with a special emphasis on music or science education.

Keywords: Quantitative methods, Science education, Student learning, Teaching/instruction

Presenting Author:Ariane S. Willems, University of Goettingen, Germany; **Co-Author:**Sonja Nonte, University of Goettingen, Germany; **Co-Author:**Tobias Stubbe, University of Goettingen, Germany

Based on a sample of classes with a special emphasis on a) science (STEM) resp. b) music education, as well as c) classes without such a specific focus, we explored (i) whether there are characteristic profiles of teaching quality in classes with a special emphasis on music resp. science (STEM) education and (ii) how these profiles can be described in terms of the three basic dimensions of classroom management, student support and cognitive activation. Moreover, we will investigate if there are systematic relations between the students' self-concept of ability and their subject-specific interest on the one hand and their perception of the instructional quality on the other hand. We surveyed $N=478$ students in 21 classes in Lower Saxony (Germany) at three points of measurement (grade 5, 6 and 7). In order to determine and describe characteristic profiles of instructional quality within the different classes, we applied Latent-Profile-Analyses. In a second step, stepwise regression models were used to analyze in how far students' individual learning characteristics (subject-specific

achievement, interest and self-concept of ability) predict their perception of the teaching quality. The results will contribute to a better understanding of potential subject-specific profiles of instructional quality on the one hand and on the question whether students with differential initial learning characteristics perceive their learning environment differently.

Effects of learning progress assessment and differentiated reading instruction in second grade

Keywords: Primary education, Reading comprehension, Student learning, Teaching/instruction

Presenting Author: Martin T. Peters, University of Muenster, Germany; **Co-Author:** Karin Hebbeker, University of Muenster, Germany; **Co-Author:** Elmar Souvignier, University of Muenster, Germany

We investigated the effects of learning progress assessment (LPA) to monitor students' progress and a combination of LPA and worked-out material to implement assessment-based differentiated instruction on text comprehension, reading fluency and usage of reading strategies. The study was conducted in German second grade classrooms and participants (33 teachers and 619 students) were assigned to one of three conditions: a control group (CG), an intervention group 1 (IG1), which received LPA only or an intervention group 2 (IG2), which received a combination of LPA and worked-out material to differentiate reading instruction. Over the course of one school year, all students' achievement in text comprehension, reading fluency and usage of reading strategies was assessed. In comparison to the CG, neither the LPA nor a combination of LPA and the worked-out material had effects on student outcomes. Next to this, no significant difference between conditions IG1 and IG2 was found. Results are discussed regarding the implementation of LPA and assessment-based differentiated reading instruction.

Preservice teachers as learners and collaborators – Longitudinal study in Finnish teacher education

Keywords: Collaborative Learning, Pre-service teacher education, Student learning, Teacher professional development

Presenting Author: Päivi Häkkinen, University of Jyväskylä, Finland; **Co-Author:** Anne Virtanen, University of Jyväskylä, Finland; **Co-Author:** Asko Tolvanen, University of Jyväskylä, Finland; **Co-Author:** Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:** Mikko Niilo-Rämä, University of Jyväskylä, Finland; **Co-Author:** Pia Naykki, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

Nowadays, teachers need to be better prepared to work together with the other teachers, with the pupils, school staff and stakeholders outside the schools. These demands cause challenges, not only for inservice teachers, but also for teacher education. Accordingly, the aim of this longitudinal study is to examine strategic learning skills and collaboration dispositions among Finnish preservice teachers (N=365) during their first few years of studies. According to the results of the latent profile analysis (LPA), it was found that preservice teachers do not comprise a homogenous group, but they rather constitute five different profiles in their strategic learning skills and collaborative dispositions. During their first years of study, especially the first year, such changes can be seen in these profiles, which indicate that Finnish teacher education equalises students in these skills. Background variables (e.g., age, gender, high school averages, entrance exam scores, experiences working as a teacher) were not associated with these changes. This study thus offers very interesting findings about Finnish teacher education and the students who are already highly qualified, due to the stiff competition for entrance into teacher education.

Keynotes - PART 2 1

15 August 2019 13:45 - 15:15

Lecture Hall - H01

EARLI Keynote Session

Learning and Instructional Technology

Thinking Tomorrow's Computer-Supported Collaborative Learning: Challenges and Opportunities

Keywords: Computer-supported collaborative learning, Instructional design, Learning Technologies, Synergies between learning teaching and research

Interest group: SIG 06 - Instructional Design

Chairperson: Sanna Järvelä, University of Oulu, Finland

The last two decades of research on computer-supported collaborative learning (CSCL) can be characterized as the childhood of the field. That is, research on CSCL has made tremendous progress in gaining insight into the mechanisms at work during CSCL, and in developing various CSCL tools, data-analysis methods, and theoretical frameworks. Given these developments, our field is currently undergoing – just as teenagers do – an identity-formation process, and faces a number of challenges, as Wise and Schwarz (2017) stated in their recent article in the International Journal of CSCL. In my keynote speech, I will discuss two of these current challenges. The first relates to different approaches to data analysis within CSCL and addresses the apparent incommensurateness between data-driven computational analyses and theory-driven analyses of data about collaboration processes in digital learning environments. The second challenge I will address concerns the debate on whether we, as a field, need to agree (and would be able to agree) on a unified, comprehensive theory of CSCL. These two challenges hold dangers but also great potential for the field of CSCL on its path into adulthood. I will argue that instead of attempting to agree on an overarching theory of CSCL, it might be more productive for the field to use a taxonomy of CSCL support dimensions as a starting point and engage in a concerted research effort with the aim of working towards an evidence-based theoretical framework. Such a framework could help inform computational analyses and relate them to theory. And it could serve as a foundation to work towards adaptive collaborative learning support on the basis of these analyses. To me, a promising adulthood scenario for the field of CSCL would be to enable dynamically-differentiated collaborative classrooms where teachers, learners, and technology all work together to achieve the best possible learning experiences and outcomes.

Thinking Tomorrow's Computer-Supported Collaborative Learning: Challenges and Opportunities

Presenting Author: Nikol Rummel, Ruhr University Bochum, Germany

The last two decades of research on computer-supported collaborative learning (CSCL) can be characterized as the childhood of the field. That is, research on CSCL has made tremendous progress in gaining insight into the mechanisms at work during CSCL, and in developing various CSCL tools, data-analysis methods, and theoretical frameworks. Given these developments, our field is currently undergoing – just as teenagers do – an identity-formation process, and faces a number of challenges, as Wise and Schwarz (2017) stated in their recent article in the International Journal of CSCL. In my keynote speech, I will discuss two of these current challenges. The first relates to different approaches to data analysis within CSCL and addresses the apparent incommensurateness between data-driven computational analyses and theory-driven analyses of data about collaboration processes in digital learning environments. The second challenge I will address concerns the debate on whether we, as a field, need to agree (and would be able to agree) on a unified, comprehensive theory of CSCL. These two challenges hold dangers but also great potential for the field of CSCL on its path into adulthood. I will argue that instead of attempting to agree on an overarching theory of CSCL, it might be more productive for the field to use a taxonomy of CSCL support dimensions as a starting point and engage in a concerted research effort with the aim of working towards an evidence-based theoretical framework. Such a framework could help inform computational analyses and relate them to theory. And it could serve as a foundation to work towards adaptive collaborative learning support on the basis of these analyses. To me, a promising adulthood scenario for the field of CSCL would be to enable dynamically-differentiated collaborative classrooms where teachers, learners, and technology all work together to achieve the best possible learning experiences and outcomes.

Keynotes - PART 2 2

15 August 2019 13:45 - 15:15

Lecture Hall - H02 - Trivago Hörsaal

EARLI Keynote Session

Instructional Design

Argumentation, Interaction and Learning: Lessons from Science Education

Keywords: Argumentation, Interdisciplinary, Science education, Student learning

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Costas Constantinou, University of Cyprus, Cyprus

The history of science is a history of vision and argument. Yet, nobody who has experienced formal science education would ever know this to be so. In this talk, I will explore how an international program of research on argumentation in science education has contributed to challenging what it means to teach and learn science and advancing practice. And how it has contributed to the focus on dialogic teaching more broadly. The talk will draw specifically on the work that I have conducted in research on argumentation, and my efforts to effect both practice and policy. From the research perspective, I will outline work that has contributed to a body of discourse around what it means to teach argumentation in school science; how to support and develop teachers' professional capabilities to enact argumentation in the classroom; and how to assess students' competency with argumentation which has been conducted over a period of 20 years. In addition, I will offer a view of the lessons that have been learnt both for science education and other disciplines, and the challenges that must be addressed if the use of argumentation is to become a common pedagogic practice across the curriculum. From a policy perspective, I will attempt to show how research informs the process of building our conception of what it means to teach and learn a curriculum subject with particular reference to the disciplinary conceptions that were instantiated in the UK and US curriculum.

Argumentation, Interaction and Learning: Lessons from Science Education

Presenting Author: Jonathan Osborne, Stanford University, United States

The history of science is a history of vision and argument. Yet, nobody who has experienced formal science education would ever know this to be so. In this talk, I will explore how an international program of research on argumentation in science education has contributed to challenging what it means to teach and learn science and advancing practice. And how it has contributed to the focus on dialogic teaching more broadly. The talk will draw specifically on the work that I have conducted in research on argumentation, and my efforts to effect both practice and policy. From the research perspective, I will outline work that has contributed to a body of discourse around what it means to teach argumentation in school science; how to support and develop teachers' professional capabilities to enact argumentation in the classroom; and how to assess students' competency with argumentation which has been conducted over a period of 20 years. In addition, I will offer a view of the lessons that have been learnt both for science education and other disciplines, and the challenges that must be addressed if the use of argumentation is to become a common pedagogic practice across the curriculum. From a policy perspective, I will attempt to show how research informs the process of building our conception of what it means to teach and learn a curriculum subject with particular reference to the disciplinary conceptions that were instantiated in the UK and US curriculum.

Keynotes - PART 2 3

15 August 2019 13:45 - 15:15

Lecture Hall - H03 - Otto Fuchs Hörsaal

EARLI Keynote Session

Motivational, Social and Affective Processes

Educational neuroscience: promises and pitfalls

Keywords: Attitudes and beliefs, Cognitive development, Neuroscience, Social development

Interest group: SIG 22 - Neuroscience and Education

Chairperson: Nienke van Atteveldt, Vrije Universiteit Amsterdam, Netherlands

Cognitive neuroscience investigates processes that are relevant to teaching and learning. Yet, implementing neuroscientific findings in the classroom is by no means straightforward. Any uncritical transfer 'from brain scan to lesson plan' is likely to trigger unrealistic expectations and the formation of so-called neuromyths. In this presentation, I will outline general principles for neuroscientific research that aims to generate educationally relevant knowledge and I will discuss the promises and pitfalls of this approach. First, educational neuroscience should be based on an integration of theories and methods from cognitive neuroscience and educational science. Second, the experimental paradigms used in cognitive neuroscience should aim to systematically incorporate factors that are characteristic of the complex classroom situation. Third, field studies should be conducted to investigate the meaning of insights from cognitive neuroscientific research for educational practice. Fourth, following a responsible research and innovation approach, researchers should organise the active involvement of stakeholders in the design of the studies and the communication of the results. We have initiated such an approach, focusing on the development of motivation and social cognition in adolescence. In the presentation, several studies will be discussed, that focus on the interplay between the behavioural and neural mechanisms of motivation and social cognition, and the social context of the classroom.

Educational neuroscience: promises and pitfalls

Presenting Author: Lydia Krabbendam, Vrije Universiteit Amsterdam, Netherlands

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Session P 1

15 August 2019 15:30 - 17:00

Lecture Hall - H10

Symposium

Teaching and Teacher Education

Student, teacher, and observer ratings of teaching quality: Investigating reasons for (dis)agreement

Keywords: Achievement, Student learning, Survey Research, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

Discussant: Jan Hochweber, University of Teacher Education St. Gallen, Switzerland

Although there is widespread agreement that teaching quality is highly relevant for student outcomes, its measurement is still subject to ongoing discussions. Researchers and practitioners often assess teaching quality by using ratings from students, teachers, or (trained) observers. One of the biggest challenges of instructional research is that empirical studies have repeatedly found low or even zero correlations between these data sources, even when applied to the same sample of classes (e.g., Clausen, 2002; Kunter & Baumert, 2006; Wagner et al., 2016). This is highly problematic for educational research and practice as results and feedback are thus largely dependent on the data source used. Reasons for these differences between perspectives have been surprisingly little investigated so far. Therefore, the present symposium focusses on these reasons. The basis of the symposium is a theoretical paper that outlines a conceptual framework for explaining (non-)agreement between perspectives. Additionally, three empirical papers systematically test core assumptions of this conceptual

framework and draw conclusions on how to best measure teaching quality in the future.

Measuring Teaching Quality from Different Perspectives: Conceptual Considerations

Presenting Author:Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland; **Co-Author:**Benjamin Caspar Fauth, University of Tübingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany; **Co-Author:**Gerlinde Lenke, Universität Koblenz-Landau, Germany; **Co-Author:**Wolfgang Wagner, University of Tuebingen, Germany

One puzzling finding in education research is that teachers, students, and external observers only marginally agree on their ratings of teaching quality. In this theoretical contribution, we summarize and reappraise previous findings on agreement between different raters of teaching quality. We explain these findings by thoroughly examining the instruments that have been used so far to measure teaching quality. Building on this, we propose a reference perspective matrix, which should be useful in explaining the perspective-specific rating mechanisms behind responses to certain survey or observation items. This would allow specific predictions about agreement or nonagreement between different raters' perspectives on different rating items. The reference perspective matrix could thus also be a theoretical foundation for future studies on the assessment of teaching quality.

Us And Them: Comparing Classroom Level And Individual Level Referents In Climate Surveys

Presenting Author:Jonathan Schweig, RAND Corporation, United States; **Co-Author:**Jose Felipe Martinez, University of California, United States

Student surveys are widely used to appraise classroom climate. Climate indicators derived from these surveys have demonstrated reliability and are predictive of student outcomes. Many student surveys contain items that both invite students to evaluate their own behavior, and to evaluate the behavior of others. Fauth et al (2018) propose a *reference perspective matrix*, and suggest that important informational and motivational differences can arise depending on whether students are asked to rate themselves or others. Using math classroom data from the Measures of Effective Teaching (MET) project, we investigate four research hypotheses based on the reference perspective matrix proposed by Fauth et al (2018). Specifically, we explore the extent to which: 1) individual-referent items are less prone to measurement error than classroom-referent items; 2) individual-referent items have higher mean levels than classroom-reference items 3) individual-referent items have lower consensus than classroom-reference items; and 4) whether item reference is consequential for understanding relationships teacher effectiveness. Results show that individual-referent items have higher mean levels than classroom-reference items. However, we also found individual-referent items are less precise than classroom-referent items, no significant differences in levels of consensus and no relationships among item referent, consensus, or relationships with external variables. Implications of results for teacher feedback and evaluation are discussed.

Which Predicts Student Learning Better? Comparing Three Approaches of Exploring Teaching Quality

Presenting Author:Charalambos Charalambous, University of Cyprus, Cyprus; **Co-Author:**Ermis Kyriakides, University of Cyprus, Cyprus

Different approaches are often used to capture teaching quality, including classroom observations, student ratings, and teacher ratings. In this study, we compare the predictive validity of these approaches in two different subject matters (mathematics and Physical Education, PE) with respect to two types of student learning outcomes (cognitive and psychomotor). Toward this end, we used data from 3rd to 6th grade elementary schoolchildren (948 in mathematics and 944 in PE) and their teachers (50 in mathematics and 51 in PE); the data derived from instruments that were carefully aligned in order to gauge exactly the same teaching practices (either generic or content-specific). Using multi-level modeling (students nested within teachers), we compared the variance explained by aligned items measuring the same practices using each of the three examined approaches. Our analysis showed notable differences in the predictive validity of the approaches under consideration. These differences seem to depend, among other things, on whether the rater has access to relevant information to judge the behavior examined; the combination of the identity of the rater with the behavior at stake and how this behavior is judged also appeared to result in differences in predictive validity. In discussing these results, we point to the importance of judiciously combining approaches to better capture instructional quality.

Predicting Achievement with Classroom Management Is Monitoring all you need?

Presenting Author:Johanna Marder, University of Tuebingen, Germany; **Co-Author:**Wolfgang Wagner, University of Tuebingen, Germany; **Co-Author:**Richard Goellner, University of Tuebingen, Germany

Classroom Management plays a central role in most theoretical frameworks of teaching quality and has generally been found to be closely related to students' achievement gains. As the conceptualization of classroom management comprises a broad range of management strategies, most studies differ with regard to the measures that were used to assess classroom management. The present study investigates whether three well-known measures of classroom management differ in their prediction of students' achievement. Thereby, the measures differed with regard to their focus on either student or teacher behavior. We analyzed students' teaching quality ratings in mathematics and students' math achievement in a large data set of $N = 4,645$ German 10th grade students from 259 classes. Results from a latent variable model controlling for students' background variables and students behavior within the classroom showed that the teachers' classroom strategies may not foster students' achievement per se, but should be evaluated with regard to the specific class they are applied in.

Session P 2

15 August 2019 15:30 - 17:00

Lecture Hall - H11

Poster Presentation

Cognitive Science, Learning and Instructional Technology, Learning and Special Education, Teaching and Teacher Education

Writing and Literacy

Keywords: Arts, Collaborative Learning, Competencies, Comprehension of text and graphics, Cultural psychology, Culture, Higher education, History, Interdisciplinary, Language (Foreign and second), Learning disabilities, Learning Technologies, Mixed-method research, Social aspects of learning and teaching, Student learning, Technology, Writing/Literacy

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 11 - Teaching and Teacher Education, SIG 12 - Writing, SIG 16 - Metacognition

Chairperson: Prajakt Pande, Denmark

Students' Use of Diagrams in Writing Explanations: Does Instruction in Diagram Use Help?

Keywords: Competencies, Comprehension of text and graphics, Language (Foreign and second), Writing/Literacy

Presenting Author:Emmanuel Manalo, Kyoto University, Japan; **Co-Author:**Ouhao Chen, National Institute of Education, Nanyang Technological University, Singapore; **Co-Author:**Jin Wang, Pearl River College of Tianjin University of Finance and Economics, China

This study examined whether instruction in diagram use may be necessary if students are to use diagrams effectively in written communication in a foreign language. The participants were 46 undergraduate university students for whom English was a foreign language. Data were collected in three phases, during each of which the students were asked to read a passage and then construct an explanation of it in English. Three equivalent passages (requiring different types of diagrams for explanation clarity) were used in three different between-subject sequences (i.e., 1-2-3, 2-3-1, 3-1-2) across the phases to check whether the kinds of diagrams required mattered. In Phases 2 and 3 they were instructed to include at least one diagram in their explanation. However, prior to Phase 3, they were provided instruction and practice in the use of various kinds of diagrams. Results revealed that students increasingly relied more on using diagrams than text to explain key points from the passages across the three phases. However, analysis of combined (text and diagrams) representations indicate an influence of the diagrams required, suggesting that students may need more instruction and practice in the construction of more abstract diagrams (e.g., arrays in tables), and the effective integration of text and diagrams.

Poetry, meaning making and mind wandering: Implications for Education

Keywords: Arts, Cultural psychology, Culture, Writing/Literacy

Presenting Author:David Preiss, Pontificia Universidad Catolica de Chile, Chile

In this paper, I intend to capitalize in my scientific background as a creativity researcher and my experience as a writer of poetry to elaborate a theory of the dynamics involved in the creation of poetry and how this can inform the teaching of creativity and poetry in school. The theory I intend to advance here is connected with what we may call the expressive nature of poetry so in that sense is closer to its lyrical aspects. I intend to sketch some lines on the psychological dimension (and more exactly the phenomenological aspects) of the process of writing poetry. I will capitalize in different sources. First, I will refer to the way poets refer to poetry. Among others, I will reference Jorge Luis Borges (2000) and Rayner Maria Rilke (2011). Second, I would refer to interviews, which complement the abovementioned authors (Preiss & Cosmelli, 2017). Finally, I would link these sources with work advanced on mind wandering (Smallwood & Schooler, 2017). I will integrate this theory to others advanced in the psychology of creativity, and will capitalize in that framework to put this proposal into a broader context (Kaufman & Kaufman, 2009) and elaborate on its educational implications.

Lesson study or lesson development? Teachers' collaborative learning in basic skills

Keywords: Collaborative Learning, Interdisciplinary, Social aspects of learning and teaching, Writing/Literacy

Presenting Author: Pernille Fiskerstrand, Volda University Collage, Norway

The aim of this study is to explore how a traditional lesson study arrangement might be useful in developing a more explicit discipline specific writing instruction for the respective teachers involved. Lesson study in general, as a way to improve teaching, is a well-known tool (Lewis m. fl., 2012; Hiebert & Morris, 2012). However, in this study the focus is set at implementing writing as a basic skill across the curriculum – using lesson study to reach this goal.

The findings point out that these teachers worked towards a deeper understanding of the topic (paragraph features) which they chose, in different ways. A particular interesting finding is how the teachers who all are experienced writing teachers, got useful insights from the Norwegian teacher in working with the students' paragraph understanding. All five teachers had been teaching the features and functions of a paragraph, but the Norwegian teacher's explicit and precise language, gave the other group members an expanded metalanguage. On the other side, the findings also show that the Norwegian teacher, the initiative taker for the group, was especially important. Her role as a leader for the group seems to be the most important factor for the success of this project.

Text Revision in Inclusive Classrooms

Keywords: Learning disabilities, Mixed-method research, Student learning, Writing/Literacy

Presenting Author: Daria Ferencik-Lehmkuhl, University of Duisburg Essen, Germany

Text Revision in Inclusive Classrooms The research project "Text Revision in Inclusive Classrooms" aims at gaining detailed insights into text revision processes of students in inclusive classrooms: It examines how well students at a German secondary school (Gymnasium) with different learning abilities, writing skills, talents and needs, coming from diverse linguistic, cultural and religious backgrounds, revise texts in German language classes. Three types of inconsistencies (spelling, meaning, text structure) and three sub-processes (detection, diagnosis, correction) are being studied systematically. The project (starting in spring 2019) compares 200 5th and 6th graders in their abilities to revise narrative texts. The research addresses three major questions: (1) Do students have more difficulties finding and/or correcting spelling errors, meaning inconsistencies or structural issues? (2) Which part of the revision process (detection, diagnosis, correction) is the most challenging? (3) Which (individual) challenges of text revision have to be considered when designing a training program? Since good writing results from effective revision, attempts need to be made to enhance revision skills through a special instruction that consider the needs and abilities of all learners. The poster will present first findings regarding the revision skills of diverse learners in German classes.

Features of Historical Reasoning in Undergraduate English Language Learners' Writing

Keywords: Higher education, History, Language (Foreign and second), Writing/Literacy

Presenting Author: Kristin Sendur, University of Amsterdam / Sabanci University, Turkey; **Co-Author:** Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:** Carla Van Boxtel, University of Amsterdam, Netherlands; **Co-Author:** Kees Jan Kan, University of Amsterdam, Netherlands

Writing in history features key elements of historical reasoning, including the use of evidence, sourcing, contextualization and corroboration. While well-studied among proficient and native English speakers, the historical writing of English language learners and the role of their English proficiency is not well understood. This study examines the performance of undergraduate English language learners when writing document-based essays with primary and secondary sources. Using an analytical rubric, we assess students' historical reasoning as evident in their writing from an historical reasoning course. Results indicate that students are able to reason historically, albeit in a quite shallow manner. An analysis using linear latent growth modeling indicates that over the duration of the course, the historical reasoning in students' writing changed in a statistically significant manner. Language proficiency does not appear to play a role in students' performance.

Using speech recognition to facilitate writing for children with dyslexia – for whom does it work?

Keywords: Learning disabilities, Learning Technologies, Technology, Writing/Literacy

Presenting Author: Åsa Wengelin, University of Gothenburg, Sweden; **Co-Author:** Sanna Kraft, University of Gothenburg, Sweden; **Co-Author:** John Rack, Linnaeus University, Sweden; **Co-Author:** Fredrik Thurfjell, University of Gothenburg, Sweden

Over the past decade has become an everyday activity for most people around the globe and schooling beyond the first few years incorporates aspects of writing in almost every activity. This frequently becomes an obstacle for children with reading and writing difficulties. While they often overcome their reading problems, spelling difficulties and difficulties with text production frequently remain (Berninger, 2006). In this (ongoing) study we use a speech recognition system to investigate (a) whether speech recognition can reduce the cognitive load of spelling and thus contribute to free up cognitive capacity for higher order processes, and b) if this is true for some but not for all of them — what distinguishes children who benefit from speech recognition from those who don't? In order to answer the first question we compare typed and dictated expository texts produced by children with and without reading and writing difficulties on how super heroes would deal with bullying and cheating. For the second question we will use a test battery to identify characteristics of children who seem to benefit from using the speech recognition and from those who don't. Data collection is still in process but preliminary analysis of the data produced so far indicates that the children produce longer texts when they dictate than when they type. However, it seems as if children who are better readers are more likely to be successful users of speech recognition. On our EARL poster we will present complete analyses and discuss the results in more detail.

Session P 3

15 August 2019 15:30 - 17:00

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Learning and Social Interaction

Screen-mediated permeability: teaching and learning in the company of personalized phone content

Keywords: Bilingual education, Conversation/ Discourse analysis, Ethnography, Peer interaction, Social interaction, Video analysis

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Fritjof Sahlström, Åbo Akademi University, Finland

Organiser: Marie Tanner, Karlstad University, Sweden

Discussant: Giulia Messina Dahlberg, University of Gothenburg, Sweden

In recent years, Nordic classrooms have become connected from within through the students' own smartphones. From a student perspective, being continuously connected through the company of smartphones makes classroom walls permeable, bringing in new spaces for co-occurring spatially unlimited multimodal interaction. To the individual student the smartphone affords personalized content on the phone, to which peers and teachers have restricted access. In this symposium we take an interest in how the company of smartphones alters participation in classroom interaction, and the consequences this has for the social organisation of teaching and learning. Theoretically we draw on previous research about learning as social actions constituted in interaction, and research on how participants use screen mediated resources and other verbal- and non-verbal interactional resources in ways that have multifaceted consequences for teaching and learning. The four contributions to the symposia use video ethnographic data from Finnish and Swedish upper secondary classrooms, that capture

both screen-mediated and classroom situated social interaction, making it possible to study the social and spatial affordances of the screen. The symposium is a contribution to the discussion about developing ways of documenting, analysing and understanding connected sociality from a teaching and learning perspective, and to the need for further developing methods that are capable of documenting and analyzing situated mobile device use. The symposium intends to facilitate an interactive discussion during the session through the internet based sharing and commenting software Flinga.

“Omg talk existence instead plz :)))”. Learning in phone mediated classroom participation

Presenting Author:Marie Tanner, Karlstad University, Sweden; **Co-Author:**Christina Olin-Scheller, Karlstad University, Sweden

Through their smartphones, students in classrooms can connect themselves to the outside world and are also available for initiatives from persons out of school. In this paper we analyze video recordings and screen captures of a screen-mediated chat where a student that are home being sick starts a chat conversation with a friend in the classroom, and their interaction about the content for the lesson. The aim is to identify what interactional resources they use to create a shared understanding of the content of the teaching, and how they jointly accomplish a learning trajectory that evolves through their phone-mediated conversation. Using multimodal conversation analysis, we show and discuss the different resources participants use to manage cohesion and change in relation to a co-constructed content in this teaching and learning oriented interaction. The participants make indexations to shared contextual understandings, in this case about the classroom routines as well as spatial and social arrangements, to create a common ground for the conversation. They also use screen-mediated resources like scrolling back in chat histories and different semiotic and linguistic resources to accomplish cohesion in the evolving interaction that is closely coordinated with the co-occurring teaching, and with peer interaction in the classroom.

Photoblogs and re-territorialisation of teaching and learning in a psychology lesson on puberty

Presenting Author:Fritjof Sahlström, Åbo Akademi University, Finland; **Co-Author:**Antti Paakkari, University of Helsinki, Finland; **Co-Author:**Verner Valasmo, Åbo Akademi University, Finland

Mobile phones make new and individualised content readily available for students inside a classroom. Phones bring social media and messaging applications into the classroom, thus changing that space and introducing wholly new questions regarding power relations, agency, technology, and equality. This presentation looks at the possible consequences of this through the lens of one upper secondary school psychology lesson on puberty, where teaching content is contrasted and commented on by a student using a photoblog application on their phone. Using concepts of de- and re-territorialisation from Gilles Deleuze and Felix Guattari, we analyse the emerging classroom assemblage where diverse elements gather together through mobile phones. During the lesson, territories such as puberty are challenged in the school life of young people through their mobile phone use in class. Analysing a student's Tumblr photo stream, we show how mobile phones challenge the existing territorialities in a classroom. We locate three central de-territorialising movements: in relation to the physical space of the classroom; to the affective space of the classroom; and to the notion of body in puberty. This helps to show how learning takes diverse forms during a lesson and how teaching has to negotiate with new information sources.

Private phone-mediated interaction as a resource for doing language learning in classrooms

Presenting Author:Fredrik Rusk, Nord University, Norway

The development of smartphones and mobile Internet have advanced tremendously since 2000 and have made the access to communication increasingly available in diverse settings, including classrooms. Today, smartphones are used in classrooms as part of both on- and off-task activities. For multilingual participants, this communication involves several languages. Previous research shows that classrooms are often oriented to and jointly constructed as monolingual settings in which participants orient to the language of instruction. In the research reported here, I focus on the ways that multilingual participants orient to and use mobile digital technology to do language learning in these classrooms, that is, how participants can, in-and-through the use of mobile communication, actively do language learning with multilingual co-participants outside of the classroom across time and space. Nevertheless, the mobile interactions also influence and contribute to classroom interactions and vice versa. The digitally-local multilingual language learning done and expressed in mobile interactions appears not to be problematized in the same manner as explicitly multilingual turns in the non-digital classroom may be oriented to as interactionally problematic. The verbal, non-digital, classroom becomes—in the interactional spaces afforded by the mobile communication—multilingual, as the participants do multilingual language learning in-and-through their digitally-mediated interactions through smartphones.

Learning and longitudinality in mobile phone interaction in classrooms

Presenting Author:Fritjof Sahlström, Åbo Akademi University, Finland

Classrooms, which used to be limited to the interactional space confined by their physical walls, have become connected from within through the students' own smartphones, and have hence become spaces for co-occurring spatially unlimited multimodal interaction. This paper is interested in learning and change in screen-mediated interaction in classrooms, and the coordination of screen interaction and co-occurring verbal interaction. For the analysis, the paper relies on the notion of epistemic topicalization, i.e. how epistemic stance verbs such as think, see, know and understand are relied upon for establishing an orientation to learning and change. The data consists of compiled video recordings from multiple sources (face-to-face interaction, laptop screen recordings, mobile phone screen mirroring) of student interactions in Finnish upper secondary classrooms (113 hours). The results show that students use different practices to accomplish longitudinal change, such as chat history features to scroll back and check relevant information, epistemic topicalization for making relevant prior shared interaction on the concerned content and indexing when moving between applications while chatting with the same participants on the same content. Further, the results show that the phone-mediated interaction is closely coordinated with the co-occurring teaching, and with co-occurring peer interaction. The study underlines the need for further research into new and rapidly increasing forms of connected human sociality in educational settings, and their coordination with co-occurring teaching and face-to-face peer interaction. The results contribute to the continued empirically based conceptualization of learning and teaching in the company of massively present screen-mediated sociality.

Session P 4

15 August 2019 15:30 - 17:00

Lecture Hall - H08

Symposium

Teaching and Teacher Education

Using ICT to reflect upon teaching in teacher education and professional development

Keywords: Collaborative Learning, Computer-supported collaborative learning, Cooperative/collaborative learning, E-learning/ Online learning, Educational technology, Peer interaction, Pre-service teacher education, Reflection, Secondary education, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Susi Klaß, Germany

Organiser: Susi Klaß, Germany

Organiser: Alexander Groeschner, Germany

Discussant: Heli Ruokamo, University of Lapland, Finland

Self- and external reflection upon teaching is a crucial aspect for teachers' professionalization throughout the career (Schön, 1987). To enhance reflection, opportunities to talk about teaching in teacher education and professional development are pivotal. ICT (Information and communication technologies) offer a new perspective in this realm. The four presentations provide different innovative approaches by using ICT to observe pedagogical practice and/or reflect upon teaching systematically. The first paper describes the use of mobile apps, (1) to record lessons as an anchor for reflection and (2) to promote exchange and discussion within peers and mentors to trigger preservice teachers' in-depth reflection upon teaching. In the context of a research and development project, the second paper describes video-based reflection between teachers and researchers to discuss the progress of implementing ICT, which is used to extend teacher noticing in the classroom. The third paper describes the use of a blended learning environment to enhance mentoring, which helps preservice teachers during a teaching practicum in systematically planning and reflecting on their teaching. The fourth paper addresses the use of an online (video-based) learning

environment to enable peer-feedback among preservice teachers regarding first teaching experiences during a teaching practicum. The discussion in this session will ask how the results can be decisive for using ICT in teacher education and professional development. As a common feature, all studies focus on an evidence-based approach to reflect upon teaching (today) for an education of tomorrow. References Schön, D. A. (1987). *Educating the Reflective Practitioner*. San-Francisco: Jossey-Bass Publishers.

Anchoring Reflection in Mobile Note-Taking: Case Studies with Preservice Teachers

Presenting Author: Regina Schmid, Schwyz University of Teacher Education, Switzerland; **Presenting Author:** Laura Müller, Schwyz University of Teacher Education, Switzerland; **Co-Author:** Michael Hielscher, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Dominik Petko, University of Zurich, Switzerland

Reflections on teaching practice can be considered as core components in teacher education programs. Nevertheless, research has shown that these reflections often remain at a descriptive level and the connection between practical and theoretical reasoning is lacking. Due to these issues, the effect on teacher learning remains to be disputed. To address these challenges, technological tools such as mobile devices might be used as scaffolds. On the one hand, mobile apps enable multimedia recordings of the lessons, which can serve as an anchor for in-depth reflection. On the other hand, the involvement of peers and mentors can promote exchange and discussions that might trigger in-depth reflections. Therefore, we developed a mobile learning app (www.metapholio.ch) and examined the levels of reflections in a pilot project with nine case studies. Preservice primary school teachers and their teacher mentors used the reflection app during an internship with a duration of two months. Data collection includes qualitative records and quantitative log files from the app. In addition, the preservice teachers completed a questionnaire on their technology acceptance at the end of the internship. The results show that most reflections include considerations of alternatives for future actions and most reflections go beyond a descriptive level. Although the preservice teachers and their mentors regularly took notes as the basis of their reflections, not all preservice teachers explicitly referred to these notes in their reflections. Further, technology acceptance was heterogeneous, but there was no clear association between the level of reflection and acceptance.

Using video as a stimulus for extending teacher noticing

Presenting Author: Maria Vrikki, University of Cyprus, Cyprus; **Co-Author:** Paul Warwick, University of Cambridge, United Kingdom; **Co-Author:** Victoria Cook, University of Cambridge, UK, United Kingdom; **Co-Author:** Louis Major, University of Cambridge, United Kingdom

The paper examines whether, and how, video-based teacher reflection on naturalistic classroom settings extends teacher noticing of critical incidents. The investigation takes place as part of a research project framed around a dialogic pedagogy, which aims to incorporate the use of a microblogging tool, *Talkwall*, into secondary classrooms in Oslo and in the UK. In this exploratory study, feedback and reflection meetings were held in between *research lessons*, during which teachers and University researchers discussed the progress of the implementation of both the pedagogy and the tool. Data comprises audio-recordings of two sessions from one secondary school in the UK, where three teachers - of English, science and geography - and a member of the research team reflected on the research lessons. To prepare for these sessions, teachers selected clips from their video-recorded research lessons for discussion. Qualitative analyses of these discussions centred around the reasons for the teachers' selection, the contributions of *others* in their reflection, and the outcome of the discussion in the form of a *frame for action*. Findings suggest that being part of a community that reflects on video data can contribute to teachers' extended noticing. Group reflections do not only help to extend the perspectives of those whose clip is being discussed, but also help other teachers reflect on their own teaching. In light of our results and our research context, we extend the concept of teacher noticing beyond the individual and the idea of critical incidents as including those where success was evident.

Learning to Teach with Content-Focused Coaching – Design of a Blended Learning Environment

Presenting Author: Fritz C. Staub, University of Zurich, Switzerland; **Co-Author:** Eva Becker, University of Zurich, Switzerland

In teacher preparation programs collaborative exchange is one of the most valuable components to help preservice teachers in systematically planning and reflecting on their teaching experiences. This exchange is most often provided by experienced classroom teachers (mentor teachers) in lesson conferences before or after a lesson. Research has shown that untrained mentor teachers usually engage in a rather directive communication style, even though interactive and co-constructive dialogues are more likely to produce learning opportunities for preservice teachers. Content-Focused Coaching (CFC) offers mentor teachers a toolset to focus the exchange with preservice teachers on relevant topics (for pupils' learning) and to find a balanced mentoring style that is more symmetric and dialogical. Previous studies, that usually involved extensive training sessions for mentor teachers, already demonstrated positive effects of CFC-training on productive mentoring dialogues. To increase flexibility for participants, a blended-learning environment for CFC-trainings was developed that combines the advantages of eLearning and face-to-face instructional settings. In the presentation, first results from a testing-phase with 54 participants (mentor teachers and peer coaches) will be presented. The acceptance and usability of the blended-learning environment is evaluated with self-reports from participants of the CFC-trainings (IEBL, Inventory to Evaluate Blended Learning by Peter and colleagues, 2014) and objective user data from the Website (e.g., time spend on website, number of read documents). In additional analyses, preservice teachers that were mentored by study participants documented the length, thematic issues and quality of dialogue from three lesson conferences in the teaching practicum.

Virtual feedback on real teaching? Enhancing preservice teachers' reflection upon teaching practice

Presenting Author: Miriam Jähne, Friedrich-Schiller-University Jena, Germany; **Presenting Author:** Susi Kläß, Friedrich Schiller University Jena, Germany; **Co-Author:** Alexander Groeschner, Friedrich Schiller University Jena, Germany

Teaching and learning presuppose continuous development. With a view to the 21st century skills, teachers have to respond professionally to the rapidly changing conditions and technical innovations. To develop teaching, reflection on pedagogical practice is helpful (Schön, 1987). In this context, approaches in practice-based teacher education include tools to re-conceptualize teaching practice e.g. by using video (Ghousseini, 2017). Moreover, research shows that the use of ICT in school is predicted by teachers' beliefs regarding ICT (Bos et al., 2014). Therefore, opportunities for preservice teachers (PSTs)' exchange and reflection upon practice could benefit by implementing ICT tools. The integration of a digital learning environment during a practicum enables the reflection upon "real teaching" and experiences in ICT use (Authors, 2016). However, the effectiveness of external (peer) reflection depends on the quality of feedback. Therefore, PSTs' competencies in formulating and receiving feedback are important (Thurlings et al., 2013). Currently, PSTs' feedback competence and also the effectiveness of video-based reflection compared to other forms of reflection (text based) are rarely investigated in research. In the present study, we implemented an online- and video-based learning environment during a practicum. Through an experimental design we investigated PSTs' beliefs about using ICT in school and the effects of an intervention group (IG 1) on feedback competence (using video feedback) compared to a group of PSTs using a written reflection (IG 2). First results show that PSTs have positive beliefs and rate their feedback competence similar high in both groups.

Session P 5

15 August 2019 15:30 - 17:00

Lecture Hall - H07

Symposium

Cognitive Science

Conceptual and procedural knowledge in mathematics learning: Open issues in theory and measurement

Keywords: Cognitive development, Cognitive skills, Educational Psychology, Mathematics, Meta-analysis, Mixed-method research, Quantitative methods, Secondary education

Interest group:

Chairperson: Terezinha Nunes, University of Oxford, United Kingdom

Chairperson: Xenia Vamvakoussi, University of Ioannina, Greece

Organiser: Xenia Vamvakoussi, University of Ioannina, Greece

Organiser: Jake McMullen, University of Turku, Finland

Discussant: Xenia Vamvakoussi, University of Ioannina, Greece

The distinction between conceptual and procedural knowledge has shaped conceptualizations of mathematical proficiency and has influenced learning objectives for mathematics in many curricula worldwide. However, there are still many open and vividly discussed issues, notably the relation between the two knowledge types and their development. Although there is currently a highly endorsed model, namely the iterative model, postulating a bi-directional relations, refinements are still necessary to account for, for example, discrepancies between conceptual understanding and procedural fluency in the individual student. Furthermore, progress in this research area depends on the development of valid and reliable measurement instruments. Last but not least, there are also issues of conceptualization of these two constructs. The papers included in this symposium address these issues. The first paper reports a study testing the assumption that conceptual and procedural fraction knowledge are indeed two distinct constructs. The second paper reports a meta-analysis on studies investigating the relation between conceptual and procedural knowledge in different content areas providing evidence in support of the iterative model. The third paper looks into inter-individual differences with respect to procedural or conceptual knowledge of equation solving, introducing the possibility of differing relations at different points in development. Finally, the fourth paper presents an overview of 4 studies investigating conceptual and procedural fraction knowledge, reflecting on the effect of the endorsed definition of these constructs, and of the difficult decisions necessary for the development of a reliable and valid instrument.

Assessing conceptual and procedural fraction knowledge – A focus on validity

Presenting Author:Katja Lenz, University of Education Freiburg, Germany; **Co-Author:**Anika Dreher, University of Education Freiburg, Germany; **Co-Author:**Lars Holzäpfel, University of Education Freiburg, Germany; **Co-Author:**Gerald Wittmann, University of Education Freiburg, Germany

Concerning students' difficulties with fractions many explanatory approaches are based on the distinction between conceptual knowledge and procedural knowledge. To get further insight into reasons and remedies for these difficulties, it is thus crucial to make the constructs accessible to valid measurement. Particularly, there is a need to investigate whether the theoretical distinction of conceptual and procedural knowledge is also empirically possible. Consequently, in this contribution, we aim at a theory-based comprehensive conceptualization of conceptual and procedural knowledge as well as a systematic operationalization and validation. The data used in this study is from 8th and 9th grade students (N = 235) of two middle schools in Germany. We used confirmatory factor analyses to investigate the structure of fraction knowledge. It was found that the theoretically assumed 2-dimensional model distinguishing between conceptual and procedural knowledge fits the data better than the 1-dimensional model and a 2-dimensional model based on a language factor (verbal - nonverbal). Further evidence regarding the aspect of discriminant validity was provided by a X^2 -difference test and an analysis of the correlations between the two knowledge types and general cognitive abilities. Our findings hence indicate that conceptual and procedural fraction knowledge can indeed be empirically separated: A theoretically grounded test instrument was developed that allows measuring students' conceptual and procedural fraction knowledge independently of each other and with a sufficient degree of validity.

The Longitudinal Relations between Conceptual and Procedural Knowledge: A Meta-Analysis

Presenting Author:Michael Schneider, University of Trier, Germany; **Co-Author:**Bethany Rittle-Johnson, Vanderbilt University, United States; **Co-Author:**Alisha Töre, University of Trier, Germany; **Co-Author:**Katharina Weber, University of Trier, Germany

Conceptual and procedural knowledge are central aims of instruction in many domains, because conceptual knowledge gives learners an understanding of the principles in a domain and procedural knowledge enables them to solve problems. Whereas there is broad agreement that conceptual knowledge fosters the acquisition of new procedures, it has been debated to what extent procedural knowledge helps to acquire conceptual knowledge. We conducted a meta-analysis on studies investigating concurrent and longitudinal relations between conceptual and procedural knowledge. We are able to include 35 effect sizes found with a total of 2119 participants with sample mean ages between nine and fifteen years. The concurrent correlation between conceptual and procedural knowledge was $r = .509$, 95% CI [.224, .794]. Conceptual knowledge predicted subsequent procedural knowledge with $r = .289$, 95% CI [.224, .354]. Procedural knowledge predicted subsequent conceptual knowledge with $r = .344$. Conceptual knowledge was more stable over time ($r = .573$) than procedural knowledge ($r = .384$). These results support the iterative model, which assumes bi-directional predictive relations between conceptual and procedural knowledge. However, the meta-analysis also highlights the need for future experimental studies allowing to draw direct conclusions about causal relations.

Individual differences in bootstrapping procedural and conceptual knowledge for future learning

Presenting Author:Jake McMullen, University of Turku, Finland; **Co-Author:**Bethany Rittle-Johnson, Vanderbilt University, United States; **Co-Author:**Jon Star, Harvard Graduate School of Education, United States

The debate surrounding the relative effects of procedural and conceptual knowledge on the learning of mathematics has had a strong impact on the focal points and methods of mathematical education research. This large body of research has uncovered inconsistent findings about how procedural and conceptual knowledge influence learning. Recent research on fraction learning has suggested that there may be inter-individual differences in the relative reliance placed on procedural and conceptual knowledge, which may explain the inconsistencies in previous findings. In order to further investigate the possibility of inter-individual differences, the present study applies this question to algebra learning. Among a sample of 527 US students in 7th and 8th grades, there were indeed substantial individual differences in the relative strength of their procedural and conceptual knowledge of algebra, which were related to their subsequent algebra learning. We found that the iterative relation between procedural and conceptual knowledge may shift throughout the learning of algebra, with basic procedural knowledge supporting more developed conceptual knowledge, and higher levels of conceptual knowledge then leads to high levels of both types of knowledge. The results introduce the possibility of differing relations between procedural and conceptual knowledge at different points in development, which may have important implications for structuring instruction in algebra.

Issues in studying conceptual and procedural fraction knowledge: Reflecting on a series of studies

Presenting Author:Xenia Vamvakoussi, University of Ioannina, Greece; **Co-Author:**Maria Bempeni, University of Ioannina, Greece; **Co-Author:**Stavroula Pouloupoulou, Athens University of Economics and Business, Greece; **Co-Author:**Ioanna Tsiplaki, University of Ioannina, Greece

The distinction between conceptual and procedural knowledge has been pervasive in psychological as well as educational research. The relation between the two types of knowledge as well as measurement issues regarding these constructs have long been debated. Addressing these issues depends crucially on the definition of the two types of knowledge. Procedural knowledge is typically defined as the ability to execute action sequences to solve problems, whereas conceptual knowledge is defined as knowledge of concepts pertaining to a domain and related principles. It has been argued that this definition of procedural knowledge is over-simplified and neglects its possible different qualities. Nevertheless this definition captures interesting phenomena such as discrepancies between students' procedural fluency and conceptual understanding; facilitates the measurement of procedural knowledge; and underlies numerous studies in this research area. In this paper we present an overview of four studies investigating secondary students' conceptual and procedural knowledge of fractions qualitatively as well as quantitatively. All studies relied on the aforementioned definition and provided evidence that a) students are more apt to deal with procedural, than conceptual tasks; b) there are individual differences, even extreme, in students' reliance on the two types of knowledge. We discuss these findings in relation to the assumptions and decisions that we had to make in order to develop a valid and reliable research instrument.

Session P 6

15 August 2019 15:30 - 17:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Cognitive Science

Identifying literacies protective against misinformation and science skepticism

Keywords: Educational Psychology, Misconceptions, Reasoning, Science education

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Friederike Hendriks, University of Münster, Germany
Organiser: Dorothe Kienhues, University of Münster, Germany
Organiser: Friederike Hendriks, University of Münster, Germany
Discussant: Eleni Kyza, Cyprus University of Technology, Cyprus

These days, we can witness attempts trying to undermine the legitimacy of science as an epistemic authority. Such attempts include examples of (purposeful) misinterpretation and denial of scientific evidence. Social media plays a quite significant role in this development, as it makes the dissemination and accessibility of information very easy, including false or flawed information. In response to these attempts, it is important to investigate both potential pitfalls in evaluating science-based information and informational attributes and educational scaffolds that facilitate information evaluation. The different contributions in this symposium all empirically investigate how individuals deal with science-based information: The first contribution (KHJB) identifies which strategies in dealing with controversial science-based issues seem appropriate and feasible for laypeople, e.g. source evaluation. The following two contributions (SSB, TYWB) both investigate how individuals judge the validity of medical information. While SSB find that the comprehensibility of information limited the discard of information from untrustworthy sources, TYWB show that knowledge of methods of scientific inquiry might benefit claim evaluations. The last contribution (LKHK) focuses on facilitating individuals' plausibility judgments about scientific and "alternative" claims with instructional scaffolds. All contributors and the discussant will draw conclusions on how to develop thinkers who are able to adequately deal with science-based information, e.g. who are able to unmask false or flawed information.

Strategies in Dealing with Science-Based Information

Presenting Author:Dorothe Kienhues, University of Münster, Germany; **Co-Author:**Friederike Hendriks, University of Münster, Germany; **Co-Author:**Regina Jucks, WWU Münster, Germany; **Co-Author:**Rainer Bromme, University of Münster, Germany

Citizens' interest in science is often triggered by practical problems of their daily lives. We differentiate two general strategies guiding laypeople's evaluation of science-based information: First-hand evaluations targeted at the content of an argument and second-hand evaluations targeted at the source of an argument. In study 1 ($N=692$), we report on the development of an inventory for measuring which of these strategies individuals use when dealing with scientific knowledge claims. A confirmatory factor analysis revealed five factors: Two refer to first-hand evaluations ("Evaluation of scientific reliability", "Searching further information"), two to second-hand evaluations ("Evaluation of the source", "Deference to further experts") and a fifth factor reflects participants' "Reliance on one's own judgments". In study 2 ($N=90$), we investigated whether these five strategies are perceived as differently useful and feasible depending on the kind of issue the scientific claim refers to. High school students were either introduced to a daily life issue (suitability of ego shooters for adolescents; $n=46$) or to a rather abstract inner-scientific issue (suitability of a specific glass for telescope mirrors; $n=44$). The kind of issue impacted on strategy-usage: individuals preferred different strategies for the two contexts, e.g. results showed a higher reliance on one's own judgments when handling the ego shooter issue in comparison to the telescope issue. It also impacted ratings on perceived feasibility in adopting the different strategies. Discussion will draw conclusions on how an understanding of the adaptive appropriateness of such strategies is important for maintaining the epistemic authority of science.

Knowing your Limits? Source Evaluation does not Override the Persuasiveness of Information Easiness

Presenting Author:Lisa Scharrer, Ruhr-Universität Bochum, Germany; **Co-Author:**Marc Stadler, Ruhr-Universität Bochum, Germany; **Co-Author:**Rainer Bromme, University of Münster, Germany

Readers seeking to avoid misinformation are required to carefully judge the validity of obtained information. Such validity judgments are particularly challenging when prior topic-knowledge is low, which strongly limits the reliability of readers' own content evaluations and instead renders the evaluation of source credibility particularly important. Previous research has repeatedly shown that in spite of their lacking topic knowledge, readers can be "seduced" into relying on their own evaluation of scientific contents when encountering text information that is easy to comprehend on a surface level. Two studies tested whether this easiness effect is prevented when readers can lean on evaluations of source credibility instead. Medical nonexperts read scientific texts varying in terms of comprehensibility and source credibility and were asked to judge the validity of contained knowledge claims. The results of both studies show that while source credibility affects claim judgment, it does not mitigate the persuasive influence of text comprehensibility. The findings indicate an educational need to further individuals' awareness of the relative importance of source evaluation in situations where prior topic knowledge is low.

Epistemic Trust and Critique of Methodology in Lay Use of Science Information for Health Decisions

Presenting Author:Michael Weinstock, Ben-Gurion University of the Negev, Israel; **Co-Author:**Iris Tabak, Ben-Gurion University of the Negev, Israel; **Co-Author:**Efrat Yahav, Ben-Gurion University of the Negev, Israel; **Co-Author:**Sarit Barzilai, University of Haifa, Israel

Assessing the trustworthiness of sources may not be the public's only or predominant recourse for evaluating science information. In this study, we aimed to examine whether and how lay readers evaluate scientific evidence in popular science news. We provided lay participants with four documents based on authentic online science news reports concerning the health status of dairy consumption. These documents described the reported studies' methodologies, but varied in the level of detail and scientific rigor. The documents were balanced for reporting on health benefits versus health risks, and had similar length and source credibility. Participants ($N=79$) thought aloud as they read the documents and considered what they would recommend to a fictitious friend with a family history of cardiovascular disease who was grappling with whether or not to consume dairy products. All of the participants commented at least once on the studies' methodology. About a quarter of the participants expressed epistemic distrust, concerned mostly that financial interests might bias the reports. This did not appear as a distinguishing factor in who evaluated the quality of methodology. Our findings demonstrate that when methodological details are available and individuals have rudimentary methodological knowledge, they critically evaluate reported methodology, despite overall skepticism about scientific reports. There is need for future research to devote greater attention to non-scientists' engagement with methodological details in popular reports. Educational implications include increased appreciation for the role of knowledge of the methods of scientific inquiry and their quality criteria as components of basic literacy for civic participation.

Instructional Scaffolds to Shift Students' Epistemic Evaluations toward the Scientific

Presenting Author:Doug Lombardi, University of Maryland, College Park, United States; **Co-Author:**Timothy G. Klavon, Temple University, United States; **Co-Author:**Margaret A. Holzer, Chatham High School, New Jersey, United States; **Co-Author:**Reed Kendall, Temple University, United States

Contemporary challenges demand scientific thinking from students and the public. For example, increasing population and human-induced climate change may limit people's access to freshwater. While such challenges are beginning to seriously impact local, regional, and global communities, an increasing availability of information has contributed to what some call a "Post-Truth Era," where emotions and personal beliefs override scientifically valid evidence and explanations. The purpose of this study was to compare the effectiveness of two different instructional scaffolds that facilitate students' scientific evaluations about the connections between lines of evidence and alternative explanations about water resources: the pre-constructed Model-Evidence Link (MEL) diagram and the build-a-MEL diagram. Although both types of scaffolds facilitated shifts in students' epistemic judgments, specifically their plausibility judgments, toward the scientific, the build-a-MEL (designed to increase students' epistemic agency by promoting metareflective knowledge construction) had a stronger relation to more deeper and scientific evaluations.

Session P 7

15 August 2019 15:30 - 17:00

Lecture Hall - H05

Symposium

Developmental Aspects of Instruction, Teaching and Teacher Education

Effective teaching and its effects on early childhood development

Keywords: Assessment methods and tools, Developmental processes, Early childhood education, Mixed-method research, Quantitative methods, Self-regulation, Synergies between learning teaching and research, Teacher Effectiveness, Teaching approaches

Interest group: SIG 05 - Learning and Development in Early Childhood
Chairperson: Jyrki Reunamo, University of Helsinki, Finland
Organiser: James Ko, The Education University of Hong Kong, Hong Kong
Discussant: Kathy Sylva, University of Oxford, United Kingdom

Aim and significance

The aim of the symposium is to present papers in an over-arching theoretical model that can integrate the different learning processes in teacher-led and child-centered activities. This first paper reports the theories and methods in a new study that aims to examine the relationships between effective teaching and childhood development. The second paper summarises some of the findings in the pilot studies conducted in Finland and Hong Kong. The third paper explores the role of self-regulation, which is conceptualised as both a dependent variable and a mediator in child development in our conceptual model. The last paper examines the role of school sponsoring bodies as it is a crucial but often neglected cross-level agent in Hong Kong education system.

The distinctive roles of individual- and school-level self-regulation in early development gaps

Presenting Author: James Ko, The Education University of Hong Kong, Hong Kong; **Co-Author:** Jin Sun, The Education University of Hong Kong, Hong Kong; **Co-Author:** Rong Kang, The Education University of Hong Kong, Hong Kong

Self-regulation is important in understanding SES-related achievement gaps, while prior studies usually focused on the mediating role of child individual self-regulation. This study examined the potential mediating roles of both individual- and school-level self-regulation in the formation of early development gaps in Hong Kong. A total of 951 Chinese children (448 girls) aged three to five were recruited from 18 kindergartens in Hong Kong. Children's cognitive and emotional self-regulation was examined with a battery of self-regulation tasks and children's early development in Academic Achievement, General Knowledge, Gross Motor, and Fine Motor Development was further assessed in individual sessions. Family SES was indexed with the variables of mothers' and fathers' education and families' monthly income while families' average SES was used to index the school-level SES. Results indicated a significant mediating role of school-level cognitive self-regulation in the early development gaps in Hong Kong while no significant effects were detected for individual-level cognitive or emotional self-regulation. The implications for future research and practical interventions will be discussed.

Effective teaching and its effects on early childhood development: Theories and methods

Presenting Author: James Ko, The Education University of Hong Kong, Hong Kong; **Co-Author:** Pamela Sammons, University of Oxford, United Kingdom

This paper reports a new study that aims to examine the relationships between effective teaching and childhood development. It is hypothesised that children can learn more from teachers who show more positive teacher-student interactions. Though policymakers in Hong Kong prefer child-led, play-based teaching and teacher-led, academically-focused teaching approach, the authors argue that teacher-child interaction quality, rather than specific pedagogy, benefits children more. Pedagogies have differential benefits on different specific learning outcomes. Thus, in Finland, there will be more plays than instructions to support socialisation with peers, more free plays than teacher-guided plays to promote self-exploration, and more one-to-one than one-to-many teacher-child interactions to obtain individualised feedback from teachers. All these might help Finnish children to develop stronger self-regulation, self-awareness and better self-care. In contrast, if Hong Kong teachers are supportive and able to make reading and counting activities more closely connected to the primary school curriculum with unambiguous seatwork set with a cognitive challenge that children find interesting, then children are prepared better for primary education. Expected outcomes will generate evidence for policymakers and practitioners on the influences of effective teaching on child development.

Findings from Pilots on Teaching Effects through Observing Children in Finland and Hong Kong

Presenting Author: Jyrki Reunamo, University of Helsinki, Finland; **Co-Author:** James Ko, The Education University of Hong Kong, Hong Kong

This paper aims to report findings in the pilot studies of instruments in Finland and Hong Kong. Comparing these two different educational cultures with the same instruments in both in Finland and Hong Kong to reveal the most effective teaching methods is crucial for our new study. This paper summarises some findings of the instruments we have tried in Finland and Hong Kong. We reveal the opportunity to learn in Finland, more active involvement in a play-based programme in Hong Kong, and the association between social orientation and school readiness in Hong Kong. These findings suggest connections between the quality of teacher-children interactions and various learning outcomes of young children.

The role and impact of School Sponsoring Body in Hong Kong kindergartens

Presenting Author: Jyrki Reunamo, University of Helsinki, Finland; **Co-Author:** Doris CHENG, Tung Wah College, Hong Kong; **Co-Author:** Yasmin Fong, The Education University of Hong Kong, Hong Kong

This paper aims to show that while positive learning outcomes depend on changes in effective teaching practices, school sponsoring bodies (SSBs) of Hong Kong kindergartens can play a more active and supportive role to change the teaching practice. According to the dynamic model of educational effectiveness by Creemes and Kyriakides (2008), school policymakers, like SSBs, can change the classroom context by changing the teaching practice more conducive to children learning. In a study commissioned by an SSB, the authors found that kindergartens that had prior teacher development on adopting a child-centred, play-based early childhood education programme showed significant improvements in at least four domains measured with the Early Childhood Environment Rating Scale (ECERS-R) (Harms, Clifton & Cryer, 1998). Thus, the authors argue that the SSBs of kindergartens can play an active role in education reform by adopting kindergarten programmes more favourable to young children development.

Session P 8

15 August 2019 15:30 - 17:00

Lecture Hall - H09

Symposium

Teaching and Teacher Education

Assessments of Teachers' Professional Knowledge, Instructional Skills and their Relations

Keywords: Assessment methods and tools, Cognitive skills, Competencies, In-service teacher education, Pre-service teacher education, Teacher professional development, Teaching/instruction, Video analysis, Vocational education

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Alicia Alonzo, Michigan State University, United States

Organiser: Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany

Organiser: Jennifer Fischer, Johannes Gutenberg-Universität, Germany

Discussant: Fien Depaepe, KU LEUVEN, Belgium

Teachers' professional performance is a complex multifaceted construct comprising knowledge dispositions, instructional and (meta-) cognitive and non-cognitive skills (Shavelson 2017). Although research on teachers' professional knowledge and skills has increased internationally, the studies often only focus on single facets measured by paper-pencil-tests rather than on (1) (performance-based) measuring of instructional skills; (2) their relation with knowledge-based dispositions; and (3) their developments (e.g. Blömeke et al. 2015). In this symposium, current innovative work on (performance-based) assessment of teachers' knowledge and skills from three countries is presented and the methodological challenges that arise when assessing teachers' knowledge and instructional skills in the different domains (physics (Presentation 1), German language (Presentation 2) economics (Presentation 3 & 4) in a valid and reliable way (according to the standards of AERA et al. 2014), and the relation between these key professional facets are examined. The development is analyzed using a comparison of groups with different teaching expertise ((under)graduate students, teacher trainees, experienced teachers) as well as using pre-post-measurement. Remarkably, the results presented here show rather low and partly empirically non-significant correlations between professional knowledge and instructional skills, indicating that the established analytical empirical approaches have significant limitations and should be complemented by holistic models in order to validly assess and to explain the development of teaching performance. By covering different teaching domains and levels, the session not only showcases the

current state of the art in valid assessment of teachers' knowledge and skills but also provides implications for improving teacher education.

Analyzing the Development of Pre-service Physics Teachers' Professional Competence

Presenting Author: Christoph Vogelsang, University of Paderborn, Germany; **Co-Author:** Andreas Borowski, University of Potsdam, Germany; **Co-Author:** Christoph Kulgemeyer, University of Bremen, Germany; **Co-Author:** Josef Riese, RWTH Aachen University, Germany

In order to acquire basic teaching skills and to apply theoretical knowledge in practice physics teacher students at most universities in Germany do an internship at schools as part of their academic teacher education. To analyze if and how their professional competencies develop over this internship we examine (a) their professional knowledge and (b) their performance in three standardized teaching situations using a pre-post-measurement-design. Besides knowledge tests for content knowledge (CK), pedagogical content knowledge (PCK), and pedagogical knowledge (PK) we developed and applied so-called 'performance assessments' for (a) planning physics lessons, (b) reflecting on physics teaching, and (c) explaining physics. Findings show that only some aspects of CK and PCK, the entire PK, and the performance in planning physics lessons increase significantly over the internship. The results are discussed concerning the connection between theory and practice in teacher education.

The Competence of Teaching Multilingual Learners – Video-Based Test with Auditory Responses

Presenting Author: Sarah-Larissa Hecker, Universität Bielefeld, Germany; **Co-Author:** Svenja Hammer, Leuphana University Lüneburg, Germany; **Co-Author:** Svenja Lemmrich, Leuphana University Lüneburg, Germany; **Co-Author:** Stephanie Klein, University of Bielefeld, Germany; **Co-Author:** Timo Ehmke, University of Lüneburg, Germany; **Co-Author:** Barbara Koch-Priewe, University of Bielefeld, Germany; **Co-Author:** Anne Köker, University of Bielefeld, Germany; **Co-Author:** Udo Ohm, University of Bielefeld, Germany

For a vast majority of pre- and in-service teachers, teaching multilingual learners in content classrooms is still challenging. A number of evidences show that multilingual learners have advantageous competencies and abilities, due to their linguistic diversity. However, linguistic heterogeneity is often considered to be a challenge. Reasons are the prevailing monolingual habitus in the German school system as well as the lack of preparation in teacher education. This presentation introduces the [anonymized] *Video test*, which measures German-as-a-Second-Language (GSL)-competency and evaluates, which opportunities to learn (OTL) are needed to offer a comprehensive teacher education that enables to teach in multilingual classrooms. Especially teaching experience and GSL specific OTL make a difference in decision making concerning teaching in multilingual context.

Measuring “Economics and Society” Teachers' Content Knowledge and Pedagogical Content Knowledge

Presenting Author: Doreen Holtsch, University of Teacher Education St.Gallen, Switzerland

Since only little is known about the professional competence of teachers at Swiss commercial vocational education and training schools, we investigated their biographical characteristics, in particular their subject-specific educational background (training program, degrees, teaching diplomas), as well as their content knowledge (CK) and their pedagogical content knowledge (PCK). 155 teachers of “Economics and Society” (E&S) in the German-speaking part of Switzerland completed a standardized test that was supposed to measure their subject-specific knowledge. On average, they answered 67% of the CK test items and 52% of the PCK test items correctly. A comparison of the educational background showed that E&S teachers holding a degree from a university of applied sciences outperformed teachers with a university degree, particularly with respect to PCK. Furthermore, teachers who had obtained an E&S teaching diploma outperformed teachers without a teaching diploma in both CK and PCK test items. The latter effect was not significant, however.

Relationships Between Teachers' Domain-specific Knowledge, Generic and Instructional Skills

Presenting Author: Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:** Christiane Kuhn, Johannes Gutenberg University Mainz, Germany; **Co-Author:** Hannes Saas, Johannes Gutenberg-Universität Mainz, Germany

Instructional skills enable teachers to react adaptively to domain-specific classroom situations and are considered a key element of successful teaching practice. However, there is only little evidence regarding the domain-specificity of teachers' instructional skills and in particular regarding the question to what extent instructional skills in one domain (e.g., economics) are influenced by domain-specific knowledge and generic (domain-independent) skills such as general cognitive abilities or situational awareness. Therefore, we modeled, validly assessed (according to the Standards for Educational and Psychological Testing by AERA et al. 2014) and analyzed the interplay between teachers' generic skills, domain-specific knowledge and instructional skills in economics among pre- and in-service teachers (N=372). The results indicate significant relationships between teachers' instructional skills and selected generic skills, which, however, become less important with the addition of domain-specific knowledge and professional experience into a regression model. Using a subject-contrasting approach for comparing our results in the domain of economics to the domain of mathematics, we expect further important insights on the domain-specificity of teachers' instructional skills and thus useful implications for teacher training practice.

Session P 9

15 August 2019 15:30 - 17:00

Seminar Room - S03

Poster Presentation

Assessment and Evaluation, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Higher Education

Keywords: Arts, Assessment methods and tools, Cognitive development, Higher education, Inquiry learning, Instructional design, Integrated learning, Metacognition, Motivation and emotion, Pre-service teacher education, Qualitative methods, Science education, Teaching approaches

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 20 - Inquiry Learning, SIG 25 - Educational Theory

Chairperson: Sittipan Yotyodying, FernUniversität in Hagen, Germany

How's it relevant to me? Student Perception of Learning Science from Transformative Activist Stance

Keywords: Higher education, Motivation and emotion, Qualitative methods, Science education

Presenting Author: Sanaz Farhangi, Florida International University, United States

Making science relevant to students' lives has been a long-desired goal of science education, but as Karen Barad has stated this will be a fruitless endeavor unless we ask: relevant for whom and for what purposes? Using CHAT and a transformative activist stance, this paper takes these questions seriously by putting students in the position of subjects of activity and asking them how they view what they do as learners and practitioners of science in introductory physics courses. I used in-depth interviews in which I asked participants to produce activity system models and conduct activity system analysis. In this exercise, participants revealed the tensions and conflicts they experienced as students as well as the schemas that shape their understanding of learning physics. I use these findings to illustrate the implications of the students' highly individualized views of learning and argue for a “collective” view that pushes the concept of contribution to activity forward to help resolve the contradictions and transform the activity of science

Energizing the college classroom: Using movement to activate learning

Keywords: Cognitive development, Higher education, Integrated learning, Teaching approaches

Presenting Author: Stacia Miller, Midwestern State University, United States; **Presenting Author:** Suzanne Lindt, Midwestern State University, United States

Research has persistently demonstrated that engaged students learn more than disengaged students. Engagement is a multidimensional construct, including behavioral, emotional, and cognitive engagement. As the focus of the university classroom has shifted from a standard lecture to a blend of pedagogical approaches involving the students, instructors seek sound methods to engage students in active learning. Physical activity strategies in the classroom enhance cognition, academic achievement, student engagement, and motivation, yet many college instructors may misunderstand engagement or may feel too many barriers exist in the college classroom to engage students in movement. However, research offers that college students who are physically active may learn

more than those with sedentary behavior. Therefore, faculty and researchers may increase engagement at the college level by incorporating movement. In this session, presenters will explain the benefits of movement in the college classroom, review the current research on physical activity in the college classroom, and present the findings from a pilot research study examining the impact of physical activity on cognitive functioning of college students.

Mind the gap! Differences in monitoring of learning for an assessment between low and high achievers

Keywords: Assessment methods and tools, Higher education, Metacognition, Qualitative methods

Presenting Author: Jeroen van der Linden, HAN University of Applied Sciences, Netherlands

To study effectively students must monitor their learning. This helps them be aware of the way and the state of their learning. Monitoring is known to foster learning. Monitoring is the skill that, if applied successfully, prohibits ignorance and prevents a deficiency or excess of attention. Cues are believed to be the vehicle that transfers metacognitive knowledge about the state of learning. However, how and when students use cues and apply monitoring and which resources they use, is not the focus of most studies. What we do know from previous research is that low achievers are less adequate than high achievers in monitoring their learning process. In his research, low and high achieving students are juxtaposed in a qualitative study to gain understanding in how they apply monitoring when studying for an assessment within a conventional assessment setting. Among others, one main finding is that it is not clear what high and low achievers precisely are. Some students use their metacognitive abilities to prevent an excess of attention, without failing: they barely pass the mark, because the system demands this. Such a student gets low grades but learns efficient. Other students obtain high grades, without having the slightest clue on forehand, not showing any metacognitive skill at all. There is much to gain in teaching monitoring skills, but the assessment system is a major factor in the way its effects learning. Real achievement demands a non-conventional assessment system or students which set high goals for themselves.

The assessment of pre-service teachers' scientific inquiry skills

Keywords: Assessment methods and tools, Higher education, Inquiry learning, Pre-service teacher education

Presenting Author: Gábor Z. Orosz, University of Szeged, Hungary; **Co-Author:** Erzsébet Korom, University of Szeged, Hungary; **Co-Author:** Mária B. Németh, MTA-SZTE Research Group on the Development of Competencies, Hungary

The purpose of this study is to assess pre-service teachers' scientific inquiry skills and compare the results as a function of faculty as a background variable. The sample included N=184 pre-service teachers attending the same university (Faculty of Science, FS: N=98, $M_{age}=22.5$, $SD_{age}=2.0$, Male=33.7%; and Faculty of Arts, FA: N=86 $M_{age}=21.3$, $SD_{age}=4.4$, Male=36%). An online test, containing 38 tasks ($N_{items}=100$) was developed to assess scientific inquiry skills (Cronbach- α FS: .90; FA: .95) on the following subscales: interpreting data, identifying variables, evaluating research questions, evaluating hypotheses, controlling variables, designing experiments, drawing conclusions. The results show that FS students perform significantly better than FA students on the test. The best performance was recorded for interpreting data with no significant difference between the two groups, and the poorest on controlling variables and designing experiment, with a significant difference between the groups. According to students' feedback, the tasks were not familiar to them. Our findings highlight the fact that even university students might struggle with controlling variables. More emphasis should be placed on fostering inquiry skills and providing the necessary procedural and epistemic knowledge during teacher training.

Problems in cross-contextual learning designs in Higher Education

Keywords: Higher education, Instructional design, Integrated learning, Qualitative methods

Presenting Author: Bernadette Dilger, University of St.Gallen, Switzerland; **Co-Author:** Luci Gommers, University of St.Gallen, Switzerland; **Co-Author:** Christian Rapp, Zurich University of Applied Sciences, Germany

Students more and more experience learning as fragmented in different contexts. The increasing need to switch contexts and deal with cross-context learning arrangements intensively leads to problems of fragmentation and isolation of learning experiences. This is an increasingly relevant obstacle for deep and meaningful learning. The Seamless Learning approach promises to support teachers in the design of seamless learning environments, by bridging the contexts. We argue that in order to understand the potential of cross-contextual learning, one has to understand the problems that occur at the seams between different contexts from a learning perspective. Based on a problem analysis across seven design-based research projects, which implement seamless learning designs in Higher Education Institutions we present an empirically grounded and conceptual deepened understanding of the problems. The results support the further conceptual development of seam-aware cross-contextual learning designs. This is relevant for faculty in their aim of designing learning experiences for students that move across different contexts.

Understanding and nurturing emergence – Exploring the temporality of being and becoming

Keywords: Arts, Higher education, Pre-service teacher education, Qualitative methods

Presenting Author: Eva Vass, Western Sydney University, Australia; **Presenting Author:** Josephine Moate, University of Jyväskylä, Finland

The proposed paper explores the temporal dimensions of learning and teaching in two distinct teacher education contexts, which centre around the facilitation of transformative experiences of professional being and becoming. It builds on our existing data (including video recordings of activities, creative products, reflective sketchbooks and written compositions) and our own experiences of the two contexts as teacher-researchers. We approach and revisit these data sets through the notion of temporality, using a dialogical analytic approach to qualitative research (Sullivan, 2012). Our philosophical framing brings together Bakhtinian dialogic theory and Natural Inclusionality (Rayner, 2017). Although from different disciplinary orientations, these theories resonate in their fluid perception of time, acknowledging time as both unfolding and connective (a continuous flux) as well as discrete and local, at least locally experienced. Such a perception of physical reality urges us to challenge traditional educational considerations of the spatial-temporal characteristics of learning. Our aim with the current paper is to unpack the ways in which space and time were managed and related to in these two educational environments, and also how students in these contexts experienced the temporality of their learning/education. Thus, our paper ultimately contributes to the problematisation of educational contexts as platforms for such fluid temporality, nurturing the dynamic, pulsating rhythm of emergence – transformative experiences of being and becoming.

Session P 10

15 August 2019 15:30 - 17:00

Seminar Room - S13

Poster Presentation

Learning and Social Interaction, Motivational, Social and Affective Processes

Motivation, Emotion and Self-Efficacy

Keywords: Achievement, Attitudes and beliefs, Competencies, Educational Psychology, Emotion and affect, Goal orientation, Higher education, Mathematics, Motivation, Motivation and emotion, Primary education, Science education, Secondary education, Self-efficacy, Video analysis

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Laurie Delnoij, Open University, Netherlands

Exploring Achievement Goals, Self-Efficacy, and Performance among New Zealand University Students

Keywords: Achievement, Educational Psychology, Goal orientation, Self-efficacy

Presenting Author: Valerie Sotardi, University of Canterbury, New Zealand

This study investigates achievement goals and their influences on self-efficacy and academic performance in a New Zealand university setting. This study aims to construct and validate an extended version of the Revised Achievement Goals Questionnaire (AGQ-R; Elliot & Murayama, 2008) by incorporating new items measuring grades-approach and work-avoidance goals. The study includes 1,028 first-year university students from one public institution in New Zealand. The hypothesised six-factor structure, its invariance across gender and ethnicity, and the predictive utility of standards-based achievement goals on academic self-efficacy and grade point average (GPA) were tested using exploratory and confirmatory factor analysis and structural equation modelling. The six-factor

structure shows initial support for acceptable reliability and validity of the six items added to the AGQ-R. Strong measurement invariance was found for gender and ethnicity. In terms of predictive utility, findings indicate that grades-approach goals bear a positive, direct effect on academic self-efficacy and GPA, whereas work-avoidance goals bear a negative, direct effect on GPA only. Results show that the inclusion of these goals explains more variance in academic self-efficacy and GPA beyond the original 2 x 2 goals model. Discussion overviews the conceptualisation and measurement of the six-factor model and further identifies a research agenda focussed on achievement goals in context and implications for pedagogical practice.

Is Seeing Believing? Comparing Perceived Similarity in a Dual-Modality Belonging Intervention

Keywords: Attitudes and beliefs, Educational Psychology, Higher education, Motivation

Presenting Author:Xiao-Yin Chen, University of Kentucky, United States; **Co-Author:**Ellen Usher, University of Kentucky, United States; **Co-Author:**Christia Brown, University of Kentucky, United States; **Co-Author:**Calah Ford, University of Kentucky, United States

Social-psychological interventions have been shown to improve students' feelings of inclusion and academic outcomes. However, few studies have attempted to understand the mechanisms through which interventions affect participants. The purpose of this study was to investigate how intervention modality and perceived similarity to the intervention actors were related to first-year U.S. university students' (N = 979) sense of belonging. Students were randomly assigned to a video (n = 498) or written (n = 481) intervention in which two ostensible former students recounted their psychological adjustment to college. Analysis of variance was used to compare students' perceived similarity and sense of belonging as a function of intervention modality, gender, or ethnic minority status. Participants in the written intervention condition, women, and ethnic majority students reported higher levels of perceived similarity. Women reported greater belonging than men. Analyses comparing the effect of shared phenotypic characteristics (gender, minority status) with the video models revealed that students whose gender matched that of the video's actor rated themselves as more similar, but this pertained only to the second video reflecting an ordering effect. Perceived similarity negatively predicted students' belonging, controlling for intervention modality and demographic factors. Findings suggest that the efficacy of interventions containing a social modeling component partly depend on delivery modality and students' perceived similarity to models. However, the effects were modest, suggesting that additional factors may enhance or undermine intervention efficacy.

Making appreciation visible - a video analyzes of a relationship-oriented facet of teacher ethos

Keywords: Attitudes and beliefs, Emotion and affect, Motivation and emotion, Video analysis

Presenting Author:Simone Ziegler, Otto-Friedrich-Universität Bamberg, Germany

To realize learning opportunities for students often the professional teacher-ethos is discussed, because the values within favor teachers' professional behavior (Baumert and Kunter, 2006). Based on their ethos some teachers aim to form positive teacher-student relationships (TSR). Within this contribution TSR will be considered as a social facet of teacher ethos that has a positively effect on students' emotional-experience during class (Seifried and Sembill, 2005). From a students' perspective a positive TSR is perceived through appreciation (Wilkins, 2006), and expressed through teachers' para-verbal, non-verbal, and verbal behavior. Unfortunately, it is unclear whether and how students recognize such appreciative behavior (Tausch and Tausch, 1971). The majority of existing studies did not yet integrate students' perspective on appreciation or have to be concretized for visibility. This contribution investigates to what extent appreciation is observable in teachers' behavior and the following students' reaction as an indicator of their perception. Furthermore, it will be examined how appreciative teachers' behavior is connected to the students' emotional-experience and their evaluation of TSR. To answer these questions, data from a videos study (18 lessons in vocational schools; 2 teachers; 53 students), and data from a questionnaire regarding the students' assessment of the TSR and their emotional-experience were analyzed. Preliminary results show that lessons are divided into 300 moments of appreciation, 20 moments of ambivalence and 7 moments of disrespectfulness. Furthermore, there are two groups of students who experience a high, medium or low level of appreciation. The implications of these findings will be discussed.

Using task-specific assessment of self-efficacy to identify individual competency profiles

Keywords: Competencies, Mathematics, Secondary education, Self-efficacy

Presenting Author:Katharina Siefer, University of Education Freiburg, Germany; **Co-Author:**Timo Leuders, University of Education Freiburg, Germany; **Co-Author:**Andreas Obersteiner, University of Education Freiburg, Germany

Research in mathematics education often focuses on cognitive aspects of competence, although studies show that non-cognitive aspects such as self-efficacy are important as well. Self-efficacy may be particularly important for solving non-routine mathematical problems in which the solution strategy is not obvious. Students with low self-efficacy may give up on such problems even if they have the cognitive abilities to solve them. Previous studies assessed self-efficacy on a general or domain-specific level but not on one content-specific level, using task-specific measures. Accordingly, the present study assesses self-efficacy in the content area of linear functions with concrete function problems. We were interested in (1) the reliability of our task-specific assessment, (2) the relation between students' self-efficacy and performance on the same problems, and (3) in students' individual profiles of performance and self-efficacy. We asked 375 8th- and 9th-graders to first predict their performance on concrete linear function problems without solving them. Afterwards, students were asked to solve the same problems. We found high reliabilities for both self-efficacy and performance measures. There was a moderate positive correlation between performance and self-efficacy. However, cluster analysis identified six groups of students with different profiles of self-efficacy and performance. While 43% of students had moderate values in both measures, 22% had very high performance combined with low self-efficacy, and 35% showed the opposite pattern. Our study highlights the importance of assessing non-cognitive aspects on a task-specific and individual level, in order to tailor instructional support to individual students' needs.

Influences of motivational constructs on scientific thinking in school-age children

Keywords: Motivation, Primary education, Science education, Self-efficacy

Presenting Author:Kristin Nyberg, University of Education Freiburg, Germany; **Co-Author:**Susanne Koerber, University of Education Freiburg, Germany

Scientific thinking is becoming an increasingly important factor in science education. Factors influencing the development of scientific thinking are subject of ongoing research. Most research in this area addresses the impact of general cognitive factors like language, intelligence, problem solving, executive functioning and specific variables (e.g. advanced theory of mind) on the development of scientific thinking (Koerber, Mayer, Osterhaus & Sodian, 2015; Osterhaus, Koerber, & Sodian, 2017). Whereas the influence of motivational aspects such as self-efficacy and interest on scientific thinking are not well investigated. Especially self-efficacy seems to be an important factor in science achievement (Jansen, Scherer and Schroeders, 2015). The current ongoing study answers this need comparing 120 secondary school children with 120 elementary school children and aims at disentangling the influences of domain general and domain specific self-efficacy as well as those of self-concept and interest on the performance in scientific thinking. Scientific abilities will be modeled in structural equation models including motivational and cognitive variables. The results can provide important implications for educational practice, for example, whether it is useful to encourage these motivational factors in students in order to improve their performance, especially in science subjects.

Session P 11

15 August 2019 15:30 - 17:00

Seminar Room - S14

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Teaching and Teacher Education

Assessment Methods and Tools

Keywords: Assessment methods and tools, Cognitive skills, Comparative studies, Computer-supported collaborative learning, Early childhood education, Educational policy, Educational technology, History, Informal learning, Instructional design, Problem-based learning, Teacher professional development, Writing/Literacy

Interest group: SIG 01 - Assessment and Evaluation, SIG 12 - Writing, SIG 14 - Learning and Professional Development, SIG 17 - Methods in Learning Research, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Marjaana Puurtinen, University of Turku, Finland

Low-stakes performance testing in Germany: Teachers' perceptions and test preparation methods

Keywords: Assessment methods and tools, Comparative studies, Educational policy, Teacher professional development

Presenting Author: Inga Wagner, University of Koblenz-Landau, Germany; **Co-Author:** Ursula Koch, Centre for Educ. Research / Univ. Landau, Germany

Low-stakes performance testing is an external evaluation method in the German school system. In the current study, we compared teachers who perceive performance testing as an instrument for lesson development with teachers considering these tests as an instrument for social comparisons or for monitoring. The aim was to investigate if there are differences between these groups of teachers regarding their methods of test preparation. We analyzed teachers' data from an online questionnaire that was implemented across seven years at elementary schools in six German federal states ($n = 6971$). Multilevel analyses show that teachers perceiving performance testing as an instrument for lesson development conduct more general and mastery oriented methods of test preparation in their classes than the two other groups of teachers. Teachers perceiving performance testing as a monitoring instrument prepare their students less for these tests than other teachers.

Assessment of collaboration with groups formed by students with and without virtual agents

Keywords: Assessment methods and tools, Computer-supported collaborative learning, Educational technology, Instructional design

Presenting Author: Matias Rojas, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile;

Co-Author: Orlando Guerrero, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Pablo Chiuminatto, Pontificia Universidad Católica de Chile, Chile

There is still no consensus on the best way to measure collaboration. The aim of this paper is to study the differences between assessing collaboration in groups of three students and assessing collaboration in groups with one student and two virtual agents. An assessment tool was designed using the PISA framework and the conditions that define a collaborative activity. This assessment requires groups of 3 students to solve a problem together by communicating exclusively via an online messenger tool using predefined messages. Two different versions were used so as to validate the possibility of using this tool as a pre- and post-test in an intervention. Studies with 325 students, aged between 11 and 13, from Santiago de Chile, revealed that it was possible to have two equivalent versions of the test, and that there were no significant differences in the results when assessing with the use of virtual agents. However, in the agent version the time it took to complete the assessment was significantly shorter. Additionally, we found that the difficulty level is an important factor when it comes to assessing collaborative problem solving, considering that it becomes increasingly difficult to collaborate.

Evidence informed practice: Critical thinking and question-posing skills in a PBL environment

Keywords: Assessment methods and tools, Cognitive skills, Instructional design, Problem-based learning

Presenting Author: Irit Sasson, University of Haifa, Israel; **Co-Author:** Shirley Miedijensky, University of Haifa, Israel; **Co-Author:** Itamar Yehuda, Tel-Hai College, Shamir Research Institute - University of Haifa, Israel

The education agenda of schools worldwide should be much broader than teaching elementary reading, writing and arithmetic abilities; it should be education for thinking and especially the ability to think critically and to formulate reasoned stances and viewpoints. Yet, there are different approaches as of what are the best practices for developing thinking skills. This research examined an innovative project-based program for 9th and 10th graders with three teachers co-teaching each lesson to maximize development of high-order thinking skills (HOT). Students learned the required ministry of education material for all subjects through projects based on group work and peer learning. The research goal was to evaluate the innovative program's effect on two skills: critical thinking and question-posing. The innovative class was compared to a traditional class learning the same material at three points in time over two years using pre- and post-case-based questionnaires. Although no significant differences were found between the classes in the critical thinking pre-questionnaire, students in the innovative learning environment had a significant advantage in this skill after two years. Significant differences in question-posing were found in the pre-questionnaire and the gaps enlarged over the research period. The results emphasize the importance of the PBL practice and the contribution of a case-based evaluation method for "evidence informed practice."

Assessment of Teachers' Gains Across Multiple Historic Site-Based Professional Development Programs

Keywords: Assessment methods and tools, History, Informal learning, Teacher professional development

Presenting Author: Christine Baron, Teachers College, Columbia University, United States; **Co-Author:** Sherri Sklarwitz, Tufts University, United States; **Co-Author:** Yiannella Blanco, Teachers College, Columbia University, United States

This paper reports on the third year of a 3-year project to assess teacher growth in historical knowledge, skills, and dispositions, at historic site-based teacher PD programs. In this third year of the study, drawn from two different historic sites—Thomas Jefferson's Monticello and George Washington's Mount Vernon, both in Virginia, USA, we found that a plurality of teachers evinced growth in historical thinking after exposure to on-going archeological and interpretive work at the sites. This is the first study to look across multiple historic sites to understand what teachers gain from their interactions with them, as well as the first to tie historical thinking gains directly to specific elements of teachers' work with historic sites.

Tools for Assessment of Young Learners Functional Writing Proficiency

Keywords: Assessment methods and tools, Early childhood education, Teacher professional development, Writing/Literacy

Presenting Author: Gustaf Bernhard Uno Skar, Norwegian University of Science and Technology, Norway; **Co-Author:** Lennart Jølle, Norwegian University of Science and Technology (NTNU), Norway

The Norwegian project Functional Writing in Primary School (the 'FUS project') is a large-scale writing intervention project with an experiment like design aiming to increase the quality of teaching and learning writing in the first years of schooling. The intervention program targets teachers' learning and will offer a range of activities and materials for e.g. functional writing instruction, and formative assessment. To that end and in order to measure students' functional writing proficiency there is a need of assessment scales. The purpose of this work-in-progress poster is to present the process of scale development and validation. The development of the FUS Scales ('FS') is divided into four distinct stages. In stage 1 relevant areas of assessment (i.e. the scales) were identified by a panel ($N = 19$) of linguists, assessment specialists and teachers reading and analyzing texts from writers in the start of 1st grade to 3rd grade. In stage 2 the same panel rank-ordered texts ($N = 400$) using comparative judgment (CJ; Pollitt, 2012), answering the question: which of the two texts is the better one. The third stage involves describing texts with different ranks, i.e. identify features that are common and distinct for top-ranked, mid-ranked and low-ranked texts. The fourth stage centres around scale validation focusing on user experience and psychometric properties of the scale including discrimination and scale step functionality.

Session P 12

15 August 2019 15:30 - 17:00

Seminar Room - S15

Poster Presentation

Learning and Instructional Technology, Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Early Childhood Education

Keywords: Case studies, Computer-assisted learning, Content analysis, Early childhood education, Environmental education, Experimental studies, Language (Foreign and second), Learning analytics, Literacy, Motivation and emotion, Psychometrics, Quantitative methods, Self-regulation, Teaching/instruction

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 07 - Technology-Enhanced Learning And Instruction, SIG 08 - Motivation and Emotion

Chairperson: Béatrice Arend, University of Luxembourg, Luxembourg

Preschool children and environmental awareness: the role of experiences in nature

Keywords: Content analysis, Early childhood education, Environmental education, Teaching/instruction

Presenting Author:Maja Antonietti, University of Modena and Reggio Emilia, Italy; **Co-Author:**Rossella Gilioli, University of Modena and Reggio Emilia - Department of Education and Human Sciences, Italy; **Co-Author:**Alessandra Ferrari, Azienda Servizi Bassa Reggiana, Italy; **Co-Author:**Roberta Cardarello, University of Modena and Reggio Emilia, Italy; **Co-Author:**Andrea Pintus, Università di Modena e Reggio Emilia, Italy

This research aims to examine in depth the theme of developing an environmental awareness in children from experiences of "immersion" in nature. In fact, educational studies recognizes the benefits for children's awareness in terms of development of emotional bonds, knowledge about the environment and respectful actions that are traceable to a long lasting, global and frequent experience of the natural environment. In this research we have interviewed two groups of 5-year-old children (each child individually) attending two Italian preschools in the same territory that have the same management authority and with similar environmental contexts in two different ways: the first group has been attending preschool for three years every week, the second group has been attending on an occasional basis. The content analysis of the responses of the first group highlights elements of interest, such as the bond with this environment, starting from the recognition of particularly pleasant or intuitive activities for children also considered unique for that context, as well as exact knowledge and specific rules to be adopted. The analysis will compare the responses of the first group with those of the second group, in accordance with international studies. This research confirms the need to offer opportunities to encounter nature in formal educational contexts, specifies some elements that are particularly attractive for children to create emotional bonds with the context, suggests some elements that can be helpful to develop environmental awareness in children and shows what actions can be taken to create similar educational experiences in nature.

Learning to Teach in a Global Crisis

Keywords: Case studies, Early childhood education, Language (Foreign and second), Literacy

Presenting Author:Rabia Hos, University of Rhode Island, United States; **Co-Author:**Halil Ibrahim Cinarbas, Middle East Technical University, Turkey

Turkey is home to 1.2 million child refugees whom has been the most vulnerable since the beginning of the Syrian conflict, which is considered to be the worst humanitarian crisis of this century. More than 50% of school age child refugees are out of school (UNICEF, 2017) in Turkey. This paper reports one of the findings of a case study of a temporary non-formal education project (Learning Turkish)[1], that focused on supporting 4-6-year-old Syrian children with Turkish language and literacy development. The purpose of the paper is to focus on the teachers' and administrators' experiences in learning to teach young refugees in the time of crisis. Data sources include in-person interviews and observations. Findings from this study confirm that in times of crisis teachers and administrators focus on being in the moment, teaching in the moment and learning to teach refugee children. Teachers and administrators reported that the experience in this project contributed to their teaching and personal development and enhanced their civic responsibility and personal growth. This study also confirmed that improvements are needed in making schooling available to all refugee children and training teachers to work with students who have experienced trauma. One of the limitations of the project was its unsustainability due to funding. The paper concludes with implications for educational policy makers and non-formal education providers.

[1] Learning Turkish (a pseudonym) was partly Funded by Open Society Foundation and donations from volunteers from the Association for the Support of the Education of Disadvantaged Individuals.

Techcat Project. How evaluate and improve four dimensions of self-regulation in preschool settings

Keywords: Computer-assisted learning, Early childhood education, Experimental studies, Self-regulation

Presenting Author:Milagros Fernandez-Molina, University of Malaga, Spain; **Co-Author:**Beatriz Barros, ETSInformatica, Spain; **Co-Author:**Monica Trella, University of Malaga, Spain; **Co-Author:**Antonio Martos, University of Granada, Spain

Executive functions are a family of top down mental processes that directly affect the well-being, academic achievement and quality of life of people, and they are developed at an early age. Childhood education (3-6 years old) is an appropriate context to evaluate and to promote the development of those skills but, at the same time, it is necessary to provide tools so that teachers can observe and select individual activities for each student in the classroom. Some researchers have demonstrated that many activities can improve inhibition control and working memory in little children (Diamond, 2016; Traverso, Viterbori & Usai, 2015) but there are few tasks designed specifically for the different dimensions of inhibition control, and there is little research on effects using technological devices. In the TECHCAT Project, a multidisciplinary team of researchers are designing technological solutions to help observe, assess and improve self-regulation skills in a preschool context. Additionally, we consider the role of individuals, school and family factors in moderating children's development of early self-regulation skills. We use a pre-post design (1 experimental and 2 control groups) with 180 children of 3-6 years old from a preschool in Malaga (Spain). In this paper, we show the characteristics of the experimental design (evaluated skills, standardized test, specific tasks, etc.), and we show results on the design process of the self-regulation tasks using adapted and original tasks: 15 motor inhibition tasks, 11 verbal inhibition tasks, 5 emotional inhibition tasks, and 7 delay reward tasks

Learner Agency of Multilingual Pupils in a Finnish Complementary Language Classroom

Keywords: Early childhood education, Language (Foreign and second), Learning analytics, Motivation and emotion

Presenting Author:Dukkeum Sun, University of Jyväskylä, Korea, Republic of

Learner Agency of Multilingual Pupils in a Finnish Complementary Language Classroom This research project starts with a simple but significant question: 'What is the true meaning of the pupils' existence as professional learners in a language class?' A successful language teaching is realized not only when a teacher effectuates the learners' performance on the target language according to the well-planned syllabus but more importantly when one senses the ongoing appearance of the pupils' identities in a keen manner. In the understandings of sociocultural view on language learning, this study explores the multilingual pupils' identity-agency through which they become independent and subjective decision makers to act to make a sense of all the potential resources (affordances) for the sake of better learning. It intends to observe how the pupils' agentive behaviors such as their willingness to use the affordances to develop the learner identity become apparent in a class and to interpret in-depth meanings of their behaviors from various perspectives such as the pupils, parents and teachers. This study is designed based on the ecological view on the immigrant pupils who learn Finnish as the target language in a complementary language classroom during a whole semester in a Finnish elementary school. This study shows how the pupils' identity-agency is presented dramatically in spite of the discrepancy between their own views on language learning and the adults' and how they make the active meaning of a language classroom through their identity-agency. **Keywords:** *affordances, complementary language classroom, ecological view, identity-agency, immigrant pupils*

Content validity study as a way to develop a children's curiosity behaviour rating scale

Keywords: Early childhood education, Motivation and emotion, Psychometrics, Quantitative methods

Presenting Author:John Kaneko, Stockholm University, Sweden

The behaviours associated with curiosity and exploration among preschool children are broadly viewed as an indicator for engagement in learning. Longitudinal studies connects curiosity and interest with better learning outcomes. The Swedish preschool curriculum, among others points out curiosity as foundational for learning activities. But what are curiosity behaviours important for preschool and school settings and could they be assessed through preschool teacher ratings? This poster brings forth and discusses the research design of a content validity approach to develop a children's curiosity and exploration rating scale. It is argued that it would be of benefit for preschool teachers in both assisting training to notice and respond to children's curiosity and also assess the amount of explorative and curiosity based behaviours children display during pedagogical activities. Possible problems concerning difficulties concerning reaching sufficient convergence on curiosity behaviour items and indicated difficulties of teacher rating validity are discussed.

Session P 13

15 August 2019 15:30 - 17:00

Seminar Room - S06

Poster Presentation

Educational Policy and Systems, Higher Education, Learning and Social Interaction, Teaching and Teacher Education

Cultural Diversity and Social Interaction in Schools

Keywords: Attitudes and beliefs, Case studies, Communities of practice, Competencies, Cultural diversity in school, Educational policy, Educational

Psychology, Emotion and affect, Engineering, Higher education, Literacy, Peer interaction, Primary education, Qualitative methods, Secondary education, Social interaction, Survey Research, Teaching/instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Janneke van de Pol, Utrecht University, Netherlands

A new education pathway for marginalised youth in the US: A model for Europe as well?

Keywords: Case studies, Cultural diversity in school, Educational policy, Engineering

Presenting Author: Frans Andersen, Aarhus University, Denmark

A NEW EDUCATION PATHWAY FOR MARGINALIZED YOUTH IN THE US: A MODEL FOR DENMARK AND EUROPE? REFLECTIONS BASED ON THE APPROACH OF THE P-TECH SCHOOLS. Abstract: *Denmark has persistent challenges with an unacceptably large 'residual group' of young people with no upper secondary education. Vocational education and training programs continue to suffer low enrollment and high dropout rates. Far too many ethnic minority boys drop out of school and educational system in Denmark. At the same time, there is a growing shortage of labor within science, technology, engineering and mathematics (STEM). In this poster I introduce and discuss an educational approach, invented in the Pathway-to-Technology (P-tech) schools in the US, as a reflection model for Denmark and Europe, based on a case study conducted in 2016 (to be repeated in 2019). P-tech is the concerted pedagogical efforts of various educational institutions, businesses and political initiatives, aimed specifically at the large marginalized and vulnerable residual youth groups in the US.*

Keywords: P-tech, disadvantaged students, new approaches to education and marginalization, education and socioeconomics

Practices used by teachers in relation to errors during whole class interaction

Keywords: Emotion and affect, Qualitative methods, Social interaction, Teaching/instruction

Presenting Author: Martin Majčík, Masaryk University, Czech Republic

The goal of the research is to identify practices which are chosen by a teacher in relation to students' errors. The research is focused on the practices that relate to errors made during the whole-class interaction. The research is qualitative, and methods of observation and interviews were used. The data was collected in ninth class of elementary school in the Czech language. Twenty-four lessons were observed from four classes and there were four interviews with teachers from these classrooms. The result of the research is the identification of four practices which are part of dealing with errors. The first two procedures represent the way of teacher's reaction to error. They are characterized as an adaptive reaction to error and a relativization of the wrong answer. The other two teachers' procedures influence the meaning of error in the social environment of the classroom. They are named as a prevention from error for selected students and a minimization of a negative conception of an error.

Teacher attitudes on the relationship between prejudice reduction practices and student engagement

Keywords: Attitudes and beliefs, Cultural diversity in school, Educational Psychology, Primary education

Presenting Author: Ceren Abacioglu, University of Amsterdam, Netherlands; **Co-Author:** Monique Volman, University of Amsterdam, Netherlands; **Author:** Agneta Fischer, University of Amsterdam, Netherlands

In many Western European countries, minority students' educational achievement continues to lag behind that of their majority group peers. This emphasizes a need to investigate factors that may help explain and improve their unfavorable educational position. In the current study, we focus on the role of teachers' efforts to reduce prejudice in the classroom, their attitudes towards multiculturalism and ethnic outgroups, and how these are related to student engagement. Using Multilevel Modeling, we analyzed data from 35 primary school teachers ($M_{age} = 43.72$, $SD_{age} = 11.83$, 66.2% female, 85.7% Dutch) and 711 students ($M_{age} = 10.62$, $SD_{age} = .95$, 51.8% female, 65.5% Dutch). Our results indicated that teachers' prejudice reduction practices can have a positive effect on student engagement only when it is accompanied by their positive explicit multicultural attitudes ($B = .10$, $p < .05$). Contrary to our expectations, teachers' prejudice reduction practices alone did not predict student engagement. In addition, we did not find any moderating effect of implicit ethnic attitudes. Our findings signal that, with their own beliefs, attitudes, and behavioral intentions, teachers themselves need to be good examples of the kind of interactions they are trying to encourage. Moreover, teachers might be able to suppress the overt manifestations of prejudiced attitudes because they have egalitarian self-concepts and hence they actively avoid favoring their ingroup; or simply because society usually disapproves discriminatory behavior.

Building Intercultural Competence of Students in Higher Education: The Role of Multicultural Beliefs

Keywords: Competencies, Cultural diversity in school, Higher education, Social interaction

Presenting Author: Lonneke de Meijer, Erasmus University Rotterdam, Netherlands; **Co-Author:** Aike Senna Broens, Erasmus University Rotterdam, Netherlands; **Co-Author:** Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands

Due to globalization, society becomes more and more culturally diverse. This translates directly into a growing diversity in the student population in higher education, also in The Netherlands. A more diverse student population, however, does not necessarily mean more intercultural student interaction (Glass et al., 2013). While this interaction may very well help students to develop their intercultural sensitivity and intercultural competences, which, subsequently, will equip them as future professionals in the urban culturally diverse context. The present study investigates the development of intercultural sensitivity and competences through inter-student intercultural interaction. Additionally, we will examine whether students' multicultural and egalitarian beliefs influence the development of these competences. In a pre-test post-test control group design we study 115 graduate students in Pedagogical and Educational Sciences at a large urban university in the western part of the Netherlands. We expect that the more students hold multicultural beliefs (compared to egalitarian beliefs), the more they will develop their intercultural competences. The results will shed more light on how to develop intercultural competences among diverse groups of students in higher education.

Enacting reading, enacting race: How one young reader becomes (in)visible

Keywords: Communities of practice, Literacy, Primary education, Social interaction

Presenting Author: Suki Mozenter, Stanford University, United States

This paper demonstrates how one student's reading practices are and are not recognized in a first-grade classroom. Some of Xaviera's reading practices were unlike those in which her classmates engaged, but some of them were quite similar. However, her reading practices generally were often recognized in ways that positioned her as a less skilled reader and as a difficult student. Being the only student who was identified as both African-American and a girl in the class, this paper examines the ways in which race, gender, and reading practices interact as these young students co-construct a community of literacy practice(s) (Wenger, 1999).

Relation between supportive climate of help-seeking and learning activities with classmates

Keywords: Educational Psychology, Peer interaction, Secondary education, Survey Research

Presenting Author: Ayafumi Goto, Gifu Shotoku Gakuen University, Japan; **Co-Author:** Motoyuki Nakaya, Graduate School of Education and Human Development, Nagoya University, Japan

The purpose of the present study was to develop a scale that measures supportive classroom climate of help-seeking and to examine the relation between supportive classroom climate of help-seeking and learning activities with classmates (help-seeking, help-giving, and peer learning). A questionnaire was completed by 765 junior high school students. First, a scale for supportive classroom climate of help-seeking scale was developed, and its reliability and validity were verified. Second, the data were analyzed by multilevel structural equation modeling at both class and student levels. At the class level, supportive classroom climate of help-seeking was related to academic help-seeking from classmates. At the student level, supportive classroom climate of help-seeking was related to all learning activities with classmates. These findings suggest the importance of the classroom climate for student engagement in academic dimensions for junior high school students.

Session P 14

15 August 2019 15:30 - 17:00

Neuroscience and Learning Analytics

Keywords: Computer-assisted learning, E-learning/ Online learning, Educational Psychology, Experimental studies, Inquiry learning, Learning analytics, Learning approaches, Mathematics, Meta-analysis, Mixed-method research, Neuroscience, Numeracy, Quantitative methods, Reading comprehension, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 15 - Special Educational Needs, SIG 22 - Neuroscience and Education

Chairperson: Thomas Moser, Norway

A quantitative review of the “spacing-of-tests” effect

Keywords: Educational Psychology, Learning approaches, Meta-analysis, Quantitative methods

Presenting Author: Alice Latimier, Ecole Normale Supérieure, France; **Co-Author:** Hugo Peyre, Ecole Normale Supérieure, France; **Co-Author:** Franck Ramus, Ecole Normale Supérieure, France

Spaced retrieval practice consists of repetitions of the same retrieval event distributed through time. This learning strategy enables mixing the two well-known “desirable difficulties”: the testing and the spacing effects (Bjork & Bjork, 2011). The present meta-analysis reviewed/investigated the spaced retrieval practice in synthesizing the results from 109 comparisons in 29 studies. It addressed two main questions: i) what are the combined effects of testing and spacing during learning in comparison to learning practices that included only spaced or retrieval practice alone? ii) is there an optimal spacing schedule for retrieval practice between an expanding schedule or a uniform one? A total of 109 effect sizes were aggregated using meta-regression with Robust Variance Estimation in order to estimate three different weighted average effect sizes. Key results from Subset 1 (39 effect sizes) gave support for a strong and robust benefit of spaced retrieval practice in comparison to massed retrieval practice $g = 1.02$; 95% CI = [0.68, 1.36]. Results from Subset 3 (54 effect sizes) indicated no superiority of the expanding spacing schedule, $g = 0.032$ (95% CI = [-0.10, 0.17]). However, moderator’s analyses suggested that the number of exposures for a given item during the retrieval practice explained the expanding superiority in some experiments. Finally, directions for future research, theoretical and educational significance are discussed.

Fostering Students’ Understanding of Fraction Magnitudes: Behavioral Effects and Neural Correlates

Keywords: Computer-assisted learning, Mathematics, Neuroscience, Numeracy

Presenting Author: Johannes Rosenkranz, University of Education Freiburg, Germany; **Co-Author:** Andreas Obersteiner, University of Education Freiburg, Germany; **Co-Author:** Thomas Dresler, University of Tuebingen, Germany; **Co-Author:** Johannes Bloechle, University of Tuebingen, Germany

Understanding fractions is one of the key mathematical competences. However, learning fractions is a stumbling block for many students. One key challenge is to understand that a fraction can represent a single numerical magnitude rather than just two separate numbers. To date, there is only limited evidence on how to support students’ fraction magnitude understanding effectively. We present a study that evaluates the effects of an intervention that aims at fostering the understanding of fraction magnitude. Taking an interdisciplinary approach, we combine behavioral and neural measures to assess what learning of fraction magnitude means, both on the behavioral and the neural level. Our study aims at bridging neuroscience and mathematics education to advance our understanding of the cognitive mechanisms of fraction learning. The intervention will be implemented with a computerized learning environment in which learners use dynamic visualizations of fractions. Sixth-graders in Germany will work with the tool in ten sessions. Learning effects will be evaluated with an experimental pretest-posttest design. Changes in neural activation will be assessed using functional magnetic resonance imaging (fMRI). At this early stage of our project, we are preparing the test instruments and developing the computerized learning environment. At the conference, we will be able to present the overall aims of this project as well as first results from pilot studies.

Imaging the effects of training on the interference effect in multiplication fact solving

Keywords: Experimental studies, Learning approaches, Mathematics, Neuroscience

Presenting Author: Alexander E. Heidekum, Karl-Franzens University of Graz, Austria; **Co-Author:** Bert De Smedt, KU Leuven, Belgium; **Co-Author:** Alice De Visscher, Université catholique de Louvain, Belgium; **Co-Author:** Stephan Vogel, University of Graz, Austria; **Co-Author:** Roland H. Grabner, University of Graz, Austria

Single-digit multiplications are thought to be associated with different levels of interference because they show different degrees of feature overlap (i.e., digits) with previously learnt problems. Recent behavioral and neuroimaging studies provided evidence for this interference effect and showed that individual differences in multiplication are related to differences in this sensitivity to interference (STI) effect. The present study investigated whether and to what extent competence-related differences in the STI effect and its neurophysiological correlates can be modulated by multiplication facts training. Two groups of students ($n = 46$) that differed in their arithmetic competencies (AC; low vs. high) underwent a 5-day multiplication facts training in which they intensively practiced a set of low- and high-interfering multiplication problems. Following the multiplication facts training a functional magnetic resonance imaging (fMRI) test session was conducted. During the scanning participants carried out a multiplication verification task that comprised trained and untrained problems. The results revealed a behavioral interference effect in the low AC group that could not be resolved by training. In the same group, we further found that the left supramarginal gyrus (SMG) was more activated for low-interfering multiplications compared to high-interfering ones. This finding supports the idea that students’ low multiplication abilities are due to the development of insufficient memory representations as a result of STI. Further, our results indicate that learning by drill (i.e., learning the association between the operands and the result) is not the right learning strategy to help this group to reduce interference.

Gifted students’ visual behaviors of reading Scratch programs: The role of computational thinking

Keywords: Learning analytics, Mixed-method research, Reading comprehension, Technology

Presenting Author: Dai-Rung Li, National Taiwan University of Science and Technology, Taiwan; **Co-Author:** You Bang Wu, National Taiwan University of Science and Technology, Taiwan; **Co-Author:** Meng-Jung Tsai, National Taiwan Normal University, Taiwan; **Co-Author:** Silvia Wen-Yu Lee, National Changhua University of Education, Taiwan

This study, using eye-tracking techniques, was to explore gifted students’ visual behaviors while reading computer programs and to explore the role of computational thinking played in it. The sample was five sixth-graders of gifted students who participated in a computer program reading task in which they were asked to read six Scratch loop programs and to predict the program’s outputs. Before the task, a computational thinking test was administered to each sample. During the task, each sample’s eye movements were recorded by an eye-tracker. To analyze students’ visual attention distributions and transitional patterns, 26 areas of interests (AOIs) were defined and three eye-tracking indices were drawn for each AOI. Spearman’s correlation analyses, lag sequential analyses, and scan-path video analyses were conducted for data analyses. Results showed that students’ computational thinking scores were highly associated with their Scratch program prediction scores. However, the *higher* the students’ computational thinking skills, the *less* attention paid to the *value changes of variables* and to the *loop areas*. The students who had lower computational thinking scores tended to have a higher error rate of program predictions, to view the variable change statements more frequently, and to show more scan-paths hard to explain. The LSA showed that the Lower CT group had a repeatedly viewing pattern on all variable change statements; while the Higher CT group did not show such a pattern until reading the most complex program. These results can provide feedback for future research designs and instructional system designs for gifted students.

Effects of web types on visual pattern, perception and performance of online inquiry learning

Keywords: E-learning/ Online learning, Inquiry learning, Learning analytics, Neuroscience

Presenting Author: An-Hsuan Wu, National Taiwan University of Science and Technology, Taiwan; **Co-Author:** Meng-Jung Tsai, National Taiwan Normal University, Taiwan; **Co-Author:** Yuping Chen, Georgia State University, United States

The purpose of this study is to examine the influences of website environments on students’ online-inquiry learning performances, perceived experiences, and

visual patterns in a socio-scientific-issue reading and searching task. A total of 70 university students volunteered to participate in this study, and were randomly assigned to either a closed-web group or an open-web group. A closed-web refers to a web-based environment in which students can only search information in an intranet with topic-relevant information; while an open-web means that students can link to external webpages with irrelevant information. In the task, all of the participants were asked to answer a well-structured and an ill-structured question about a nuclear power issue via web information search, under a FaceLab eye-tracking system. A self-reported questionnaire was distributed to ask students' perceived mental efforts, mental loads and search strategies after finishing each question. Learning achievements were scored by their responses to the two questions. T-tests were used to examine the group differences in searching strategies, learning achievements, perceived experiences and eye-tracking measures. Lag sequential analyses were conducted to observe the visual transition patterns during the web search for each group. Significant findings were found in this study for the match of the web environments and the question types. The closed-web environments seemed to benefit students from coping with well-structured problems, whereas the open-web environments were better for developing students' thinking of ill-structured problems. Future studies and implications for instructions will be discussed in details in the conference.

Session P 15

15 August 2019 15:30 - 17:00

Seminar Room - S12

Poster Presentation

Learning and Instructional Technology, Learning and Social Interaction

Metacognition

Keywords: Cognitive skills, Computer-assisted learning, Cooperative/collaborative learning, Game-based learning, Interdisciplinary, Metacognition, Problem solving, Self-regulation, Social interaction, Teaching/instruction, Technology, Video analysis

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction, SIG 16 - Metacognition, SIG 27 - Online Measures of Learning Processes

Chairperson: Daniel Araneda, Pontificia Universidad Católica de Chile, Chile

Developing a tool to better understand students' social regulation of learning in the classroom

Keywords: Metacognition, Self-regulation, Social interaction, Video analysis

Presenting Author: Thomas Harriott, University of Cambridge, United Kingdom

Students' ability to regulate learning is essential for success, academic and otherwise. As an experienced secondary teacher I have come to recognise the lack of ability many students have to regulate their own learning even late on in their secondary education. In order to better understand how students regulate themselves and others as learners in my own classroom, I have developed a taxonomy of regulatory behaviours rooted in sociocultural perspectives on regulation of learning. This has since been applied to my own classroom as well as those of others through analysis of social interactions in video recordings of learning episodes and the use of video-stimulated follow-up interviews. This methodology intends to make visible the regulatory processes occurring in the social setting of the classroom with minimal loss of ecological validity. In this paper, the coding scheme is presented alongside the application to classrooms and associated methodological approaches. The resulting case studies into how students' regulate their own and their peers' learning are presented in a novel graphical format.

Towards a reliable assessment of metacognitive instructional quality across school subjects

Keywords: Interdisciplinary, Metacognition, Teaching/instruction, Video analysis

Presenting Author: Nowinska Edyta, Universität Osnabrück, Germany; **Co-Author:** Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland;

Co-Author: Martina Blasberg-Kuhnke, Universität Osnabrück, Germany; **Co-Author:** Elmar Cohors-Fresenborg, Universität Osnabrück, Germany; **Co-Author:** Frank Lipowsky, University of Kassel, Germany; **Co-Author:** Meik Zültsdorf-Kersting, Universität Osnabrück, Germany

Metacognition is regarded as a powerful predictor of learning outcomes (Hattie, 2009; Veenman et al., 2006). Despite this fact, to our knowledge, research on metacognition did not provide any methods for reliable assessments of the quality of instructional metacognitive processes in one class in different school subjects. Such methods are needed to get insights about how metacognition influences students' learning effects in the particular school subject, and to optimize the implementation of metacognition in classes. The paper reports results from an interdisciplinary research project conducted by educational researchers interested in a deeper understanding of the role of metacognitive instructional processes in school subjects related to their own research domains (history, mathematics, religion). Their shared experience showed that metacognitive processes in lessons in history, mathematics and religion can be described and classified with the same content-independent category system. This led to the question whether the instructional quality of metacognitive instructional processes in one class in a particular school subject can be reliably assessed using the same rating procedure in history, mathematics and religion. This question motivated the development of a subject-independent rating procedure. The paper gives a brief description of the developed rating procedure and provides results concerning the reliability (and in particular the generalizability over lessons in a particular class) of ratings gained with this procedure in each of the three school subjects.

Using microanalysis to measure self-regulated learning in a game for emergency care – a pilot

Keywords: Computer-assisted learning, Game-based learning, Metacognition, Self-regulation

Presenting Author: Tjitske Faber, Erasmus MC, Netherlands; **Co-Author:** Mary Dankbaar, Erasmus MC, Netherlands; **Co-Author:** Walter van den Broek, Erasmus MC, Netherlands

Background: Self-regulated learning (SRL) skills refer to the modulation of affective, cognitive and behavioral processes when learning, to reach the desired level of achievement¹. Games could support the development of SRL skills by providing feedback. SRL microanalysis²⁻⁴ is an instrument suitable for evaluating SRL in the context of a specific task. It has been used in clinical teaching contexts, but not in games.

Aims: The aim of this study was to evaluate the use of SRL microanalysis in a game based learning context for medical students.

Method: An SRL microanalysis protocol, adapted for use in a game context, was administered to five preclinical medical students as they played a game for emergency care. Students completed a questionnaire on their experience. Two independent researchers coded the microanalysis responses into predefined categories.

Results: Some of the initial coding categories were found to converge, allowing coding of responses in multiple categories. These categories were revised by reaching consensus. After these adaptations, inter-rater reliability for the SRL microanalytic questions was reasonable for all measures except goal-setting and attribution. Although students did not report feeling interrupted, observations during the task indicated that asking questions during gameplay halted game flow. **Conclusions:** SRL microanalysis can be adapted for a game-based learning context, providing insight into SRL processes used during gameplay. Care must be taken not to interrupt game flow. This can be achieved by carefully administering questions in natural breaks in the task.

Tracing monitoring and shared regulation in collaborative learning with psychophysiological data

Keywords: Cooperative/collaborative learning, Metacognition, Self-regulation, Video analysis

Presenting Author: Eetu Haataja, University of Oulu, Finland; **Co-Author:** Jonna Malmberg, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland; **Co-Author:** Muhterem Dindar, University of Oulu, Finland

In collaborative learning students become aware of the challenges in their learning process by monitoring their cognition and task performance. In theory, awareness of these challenges can serve as a trigger for socially shared regulation of learning on which the students collectively plan, monitor and control their learning towards shared goals. However, in practice, empirical evidence of this relation is still limited and methods for tracing it in real time are scarce. This study aims to unfold the relation between valence of monitoring and shared regulation by investigating those with psychophysiological traces (arousal and physiological synchrony) of regulation in collaborative learning. In this study higher education students ($N = 74$) worked in groups of three with computer simulation task. The session was videotaped and students electrodermal activity was recorded with a mobile sensor device. Monitoring, its valence and possible

socially shared regulation following it were coded from the video data. Arousal and physiological synchrony were derived from electrodermal activity measures. Preliminary findings show that monitoring with negative valence relates more often to socially shared regulation than monitoring with positive valence. Further multilevel statistical analysis including the physiological variables will be conducted to further elaborate the findings.

Focus of attention during a modular robotic problem-solving task.

Keywords: Cognitive skills, Metacognition, Problem solving, Technology

Presenting Author:Margarida Romero, Laboratoire d'Innovation et Numérique pour l'Education, France; **Co-Author:**Dayle David, Laboratoire LINE, ESPE de Nice, France

Problem-solving is a key competency within the different educational and professional competency frameworks. Problem-solving activities engage participants in the analysis, planning and regulation of actions to propose a valuable solution. Problem-solving requires important cognitive resources to manage the schemas and process mobilised for analyzing the situation and proposing a solution. When confronted to problem-solving tasks, participants often regulate their own activity by focusing their attention selectively during the solving process. In this study, we engage participants in an ill-defined problem-solving task which requires them to explore an unknown set of robotic cubes in order to build different solutions for making the cubes move autonomously between two points. We identify the different focus of attention during the task, distinguishing local and global focus of attention. Results have led us to observe that participants adopt diverse approaches to the CreaCube task. Children, for instance, are often inhibited in their exploration of the cubes as they seem to wait for an external approval before starting to manipulate them. If some participants participate to the task as a game, others also experience it as an evaluation in which they engage part of their cognitive resources to different metacognitive judgements and processes. Among the strategies observed, ego defense preservation appears in some adult participants, hindering cognitive engagement towards the analysis, structure building and error analysis central to the CreaCube problem-solving task.

Session P 16

15 August 2019 15:30 - 17:00

Seminar Room - S04

Poster Presentation

Teaching and Teacher Education

Teacher Professional Development

Keywords: Case studies, Conversation/ Discourse analysis, In-service teacher education, Language (Foreign and second), Learning analytics, Motivation, Pre-service teacher education, Qualitative methods, Teacher Effectiveness, Teacher professional development, Teaching approaches, Video analysis

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Moira Newton, University of Auckland, New Zealand

English, Russian and Azerbaijani Teachers' Perceptions of Professional Development Needs

Keywords: In-service teacher education, Language (Foreign and second), Teacher Effectiveness, Teacher professional development

Presenting Author:Konul Karimova, University of Szeged, Hungary

Most of policymakers and educational leaders tend to assume that efficient teacher will train successful student and professional development (PD) should be mandatory in teachers' development to update them about new innovations in their areas and increase their quality that impact on student achievement. The main aim of this study is to reveal the perceptions of language teachers' PD needs, how they perceive their professional development process and explore main components which are important for teachers to be effective teachers. A total of 599 language (English, Russian, Azerbaijani) teachers were drawn from 31 schools that embraced 12 administrative districts to achieve best representation of Baku city. Each teacher completed online questionnaire for Teachers' Perception of Professional Development Needs (Purevjav & Molnár, 2016) which was based on 5-point Likert scale with total reliability (Cronbach's alpha) .97. For revealing differences among language teachers, one-way ANOVA was computed in SPSS23. Exploratory and confirmatory analyses were calculated in Mplus7 to reveal the structure of language teachers' perception of PD needs. From the analysis, it was revealed that language teachers have significant differences in their perceptions of important areas in everyday teaching practice and areas that necessary to be improved. Moreover, from exploratory factor analysis, the five-factor model was found more adequate to represent the structure of teachers' perceptions in PD needs.

Co-teaching in making projects changes collaboration and agency for teachers as well as pupils

Keywords: In-service teacher education, Qualitative methods, Teacher professional development, Teaching approaches

Presenting Author:Tellervo Härkki, University of Helsinki, Finland; **Co-Author:**Henriikka Vartiainen, University of Eastern Finland, Finland

The study explores how teachers develop collaborative teaching (co-teaching) practices for making projects. Traditionally, Finnish schools have two makerspaces: one for technical crafts and one for textile, each with a specialized subject teacher. Introducing open-ended making projects that place pupils in charge of their own learning and acquisition of innovation, collaboration and digital skills demands flexible use of both makerspaces, requiring teachers to design adaptive practices to support pupils' agency. This setting affords two vehicles for change: making projects and co-teaching.

To study the emergence of co-teaching models and related challenges, we pose two research questions. 1) What models of co-teaching appear in making projects? 2) What challenges emerge in co-teaching as teachers construct teaching practices for making projects?

The data refer to seven team interviews with teachers (N=16) at the end of the making projects. Using qualitative content analysis, co-teaching practices referred to in the interview transcripts were found to relate to planning, classroom delivery and evaluation.

The findings show that collaborative practices for planning and evaluation were more challenging to construct than for classroom delivery. The participating teachers focused on the practicalities of making projects rather than engaging in reflective conversation and developing collaborative accountability.

Although all Finnish teachers are taught to reflect on their teaching practices, in-service tradition appeared to differ. Workshops and discussion items focusing on key challenges were developed. Further changes are needed, both in school practices and in teacher education.

How is teachers' motivation related to their general pedagogical knowledge?

Keywords: In-service teacher education, Motivation, Pre-service teacher education, Teacher professional development

Presenting Author:Liina Malva, University of Tartu, Estonia; **Co-Author:**Äli Leijen, University of Tartu, Estonia; **Co-Author:**Katrin Poom-Valickis, Tallinn University, Estonia

It has been argued that teachers' motivation is an important element of their knowledge, similarly to pupils' motivation and their academic success. This study aims to find out how teachers' general pedagogical knowledge is related to teachers' motivational characteristics such as self-efficacy, self-responsibility and intrinsic motivation. Data was collected from 167 pre-service teachers and 163 in-service teachers and Teacher Knowledge Survey (Sonmark et al., 2017) was used. The results showed that there was no correlation between pre-service and in-service teachers' GPK and their self-efficacy. However, a weak positive correlation was found between pre-service teachers' and in-service teachers' self-responsibility and level of knowledge. In addition to that, the teachers who had more enthusiasm for teaching showed better knowledge. Based on these results it can be argued that feeling more self-responsibility as well as enthusiasm for teaching is related to better general pedagogical knowledge. Therefore, these motivational characteristics can lead both, pre-service and in-service teachers, to pay more attention to their preparation in order to be successful in teaching.

Facilitating highly specified video-based professional development materials with fidelity

Keywords: Case studies, In-service teacher education, Teacher professional development, Video analysis

Presenting Author:Karen Koellner, Hunter College, City University of New York, United States; **Co-Author:**Nanette Seago, WestEd, United States

Determining whether a professional development program can be enacted with fidelity in different settings and by different facilitators is critical to understanding efficacy. This study examines how we prepared one facilitator to implement the Learning and Teaching Geometry (LTG) professional development and whether

or not she implemented the program with fidelity. Two instruments were used to understand the ways in which the facilitator made adaptations and modifications in regards to time and content of the materials. Results indicate that the facilitator implemented the LTG program with fidelity under both circumstances- content and time. In this presentation we describe an example of one facilitator as she prepared to use and adapt the highly specified Learning and Teaching Geometry video-based professional development materials with fidelity.

Analytics-supported Teacher Professional Development: The Impact on Classroom Talk

Keywords: Conversation/ Discourse analysis, In-service teacher education, Learning analytics, Teacher professional development

Presenting Author:Gaowei Chen, The University of Hong Kong, Hong Kong; **Co-Author:**Kennedy Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Liru Hu, The University of Hong Kong, Hong Kong; **Co-Author:**Albert Jinjian Yu, The University of Hong Kong, Hong Kong

Driven by the need to help teachers learn and integrate productive classroom talk into their teaching practice, the paper develops an analytics-supported teacher professional development (ASTPD) approach that leverages learning analytics to facilitate teachers' reflection about their classroom teaching. The paper examined the effectiveness of the ASTPD in a longitudinal teacher professional development program in which the secondary school mathematics teachers reflected on their classroom discourse using Classroom Discourse Analyzer (CDA) for learning to use academically productive talk (APT). The results are two folded. First, according to the teachers' responses to a questionnaire, the treatment teachers' beliefs about the effects of classroom talk and their self-efficacy in guiding classroom talk have increased significantly after the PD sessions, of which the control group teachers showed the same patterns. Second, based on the classroom practice data, we found that the total number of words per lesson spoken by the treatment teachers have decreased significantly while the average words per turn spoken by their students have increased significantly. However, these discourse changes were not found in the control group's classes. The findings suggest that while the workshop of APT had positive effects on both the control and the treatment teachers' self-reported classroom talk beliefs and efficacy, only the treatment teachers who received the ASTPD had significant changes in their classroom discourse—with less teacher talk and more elaborated student talk. We then conducted qualitative analyses to understand how and why the ASTPD approach brought about the classroom discourse changes.

Diverse teachers' approaches to dialogic teacher orientation

Keywords: Case studies, Conversation/ Discourse analysis, In-service teacher education, Teacher professional development

Presenting Author:Ana Marjanovic-Shane, Independent Scholar, United States

Teacher orientation is the way teachers enact their role within teaching events. When in character, teacher's "I" is role-bounded, preplanned, and thought through in an imagined semiotic plane, out of the immediate context. A gap between teacher's subjectivity when planning his/her role and when enacting it in a teaching event, marks a unique teacher orientation, based on her/his particular pedagogical desires in the moment of teaching and her/his particular dialogic stance toward students, that may promote or hinder students' critical dialogues. I analyze ways several dialogic teachers' construct their dialogic teacher roles and reflect on their enactments of them through dilemmas they encounter in class when having simultaneous but conflicting pedagogical desires. I focus on dialogizing and analyzing these teacher's unique ways of relating to their students and to the curriculum, as I try to conceptualize the unique "organizing centers" of their teacher orientations from where they struggle to resolve their emerging and conflicting pedagogical desires and their pedagogical allegiances. Teacher orientation is not only an important way of conceptualizing the complexity of what teaching means to the individual teachers both when planning for it and when enacting their preplanned teacher roles, but it also may be a way for a teacher to critically reflect on their past teaching events and plan for the future ones.

Session P 17

15 August 2019 15:30 - 17:00

Seminar Room - S05

Poster Presentation

Assessment and Evaluation, Learning and Instructional Technology

Technology-Enhanced Learning and Instruction

Keywords: Assessment methods and tools, Computer-assisted learning, Culture, Design based research, Early childhood education, Educational technology, Knowledge creation, Learning analytics, Learning Technologies, Metacognition, Out-of-school learning, Parental involvement in learning, Problem solving, Quantitative methods, Reading comprehension, Secondary education, Self-regulation, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Stephen Darwin, Universidad Alberto Hurtado, Chile

Seeing the classroom: Using machine learning to observe teaching and technology integration

Keywords: Educational technology, Learning analytics, Teaching approaches, Teaching/instruction

Presenting Author:Sarah Howard, University of Wollongong, Australia; **Co-Author:**Jie Yang, University of Wollongong, Australia; **Co-Author:**Jun Ma, University of Wollongong, Australia; **Co-Author:**Christian Ritz, University of Wollongong, Australia; **Co-Author:**Jiahong Zhao, University of Wollongong, Australia; **Co-Author:**Kylie Wynne, NSW Department of Education, Australia

Understanding technology integration in teaching and learning continues to be difficult. As a result, how digital technologies can best be used to support learning is still not well understood. A key reason for this is difficulty understanding the wider classroom context and, therefore the context of learning over time. This paper will present methods to capture and analyse learning and relevant teaching practices, over time, to begin to unpack learning processes related to technology integration. Using new technologies, data mining and machine learning approaches this paper presents an extended classroom, visualizations of movement and audio, and the teacher's reflections on how results will impact on their practice. To do this, a low-disturbance classroom observation kit is used to observe a secondary Science classroom for two months. Video and audio data are analysed and the teacher is asked to reflect on the results. The teacher makes connections between pedagogy and both of the visualizations. They identify key changes that were implemented in the unit, in the following year. Implications for technology integration and future data collections are discussed.

Home Tablet use and its relationships with reading performance of 6-8 year-olds

Keywords: Computer-assisted learning, Early childhood education, Parental involvement in learning, Reading comprehension

Presenting Author:Álvaro Jánhez, University of Salamanca, Spain; **Co-Author:**Marta Ramos, Salamanca University, Spain; **Co-Author:**Raquel De Sixte, University of Salamanca, Spain; **Co-Author:**Javier Rosales, University of Salamanca, Spain

The potential benefits or hindrances of tablet devices have been a topic of concern for parents, teachers and researchers. However, findings are inconsistent and focused on early literacy skills. The present study analyses the home tablet use of 190 children ranging from 6 to 8 years old, and its effects on reading performance. Results show how tablet users outscore non-users on several reading outcomes, depending on age. Also, some specific activities, like playing videogames, are related to both positive (better word identification) and negative (worse reading comprehension) outcomes at the same time. These results suggest not only that tablet use alone is not a good predictor of academic achievement, but also that specific uses of tablets must be explored further, since their impact will depend on the outcome measures selected and the age of the users. Future studies should focus on a wider range of variables, and general recommendations about promoting or limiting tablet use should be interpreted with caution.

Design of digital learning environment based on cultural local principles for knowledge convergence

Keywords: Computer-assisted learning, Culture, Educational technology, Knowledge creation

Presenting Author:Andrea Ximena Castano, National University of Education, Ecuador

The aim of the study was to investigate how to design a digital learning platform based on Andean native principles to attain a knowledge convergence practice.

The study was conducted following Educational Design Research methodology where a systematic process of analysis, design, development and validation of the digital learning environment, and the educational processes involved for research in knowledge convergence and students' interaction in the multi-modal learning environment. The methodology featured three main phases: (1) preliminary research; diagnosing of the teacher-students' digital needs regarding interaction with digital platforms, participants (N=203) provided answers in a validated survey of previous experiences and perceptions with learning platforms; (2) prototyping stage, focused on designing and development of the digital platform based on the Andean native principles and contemporary knowledge; (3) Validation of the functionality of the platform through students' practices using and providing educational resources on the platform to create and adapt teaching lessons, so the convergence of knowledge can be validated. Results showed the application of the methodology were suitable for this kind of innovative research approach where the development and use of a digital platform were needed to be designed, developed and validated to prove its use in a digital learning environment. Furthermore, students manifested a sense of belonging and authoring with the digital learning resources, while maintaining their cultural identity related with the functionality of the platform coherent with native Andean principles part of their local context, so their productions can be adapted abroad.

Computer Science On the Move - An empirical study to foster computational thinking

Keywords: Assessment methods and tools, Problem solving, Quantitative methods, Secondary education

Presenting Author:Katinka Penert, Rudolf Steiner Schule Winterthur, Switzerland

Industry 4.0 requires code-literacy and computational thinking as key competences (Wing 2006). Therefore, schools are expected to supply technical equipment and empower teachers in computer-based programming. Alternatively, activities of CS Unplugged provide a participatory way of acquiring key concepts of Computer Science and computational thinking without using computers. In many educational settings, especially such that lack the technical equipment either because of financial constraints, missing reliable power supply or Internet connection, or because of an explicit intention not to work with technical equipment there is an existing or potential future demand of teaching computational thinking as key concept of Computer Science independently of any system or particular software. This contribution describes an approach of teaching Computer Science unplugged in secondary education without using digital devices and digital application tools. It targets pupils of classes 6 to 9, providing them with a team- and movement-based and sensorially stimulating analogue programming environment in order to foster knowledge about the fundamental concepts of computational thinking. Pupils applied computational thinking in their algorithms working collaboratively on compelling problems in a visualised programming environment. This intervention is being evaluated in a controlled trial. Preliminary results from the Computational Thinking test show that the intervention fosters computational thinking. Should the final results of the trial, which will be presented at the conference, be consistent with the preliminary outcome, the movement enhanced CS Unplugged programme should be implemented in schools. Implications for further research and for teacher training will be discussed.

Invent with Environment: A Maker Course for Environmental Science and Art

Keywords: Design based research, Learning Technologies, Out-of-school learning, Teacher professional development

Presenting Author:Mamta Shah, Drexel University, United States; **Co-Author:**Aroutis Foster, Drexel University, United States; **Co-Author:**Raja Schaar, Drexel University, United States

In this concurrent mixed-methods exploratory study, we aim to leverage the constructionist view of learning in maker activities to promote the development of 21st century knowledge and skills (Kereluik et al., 2013; Papert, 1980) among high school students and facilitate their motivation to learn (Author, 2008) in Science, Technology, Engineering, Arts and Mathematics (STEAM) through guided play-based experiences in an environmental education center. The objectives of this year-long study include, to examine change in: (1) environmental educators' (EE) knowledge and motivation to adopt maker-centered learning to support students' interest in environmental science and art; (b) students' disciplinary knowledge, regulated actions, interest and valuing, and self-perceptions and self-definitions for environmental science and art as a result of engaging in a maker course. This poster will describe the application of design-based research approach (Cobb et al., 2003) to collaboratively design and iteratively refine *Invent with Environment: A Maker Course for Environmental Science and Art with EEs from October 2018-June 2019*. Briefly, in Fall 2018-participating EEs will engage in hands-on experiences with LittleBits invention kit, learn about Projective Reflection as a theoretical conception of facilitating learning in the 21st century (Author, 2014), and learn about the Play Curricular activity Reflection Discussion pedagogical model (Author, 2015) over 2-weeks. This will lead to the creation of a maker curriculum for high school students to develop knowledge and interest in environmental science and art. In Winter 2019 the course will be offered (4-weeks), followed by course-refinement, and a course-reoffering in Spring 2019 (4-weeks).

Teaching self-regulation strategies in task-oriented reading: ITSs or classroom instruction?

Keywords: Computer-assisted learning, Metacognition, Reading comprehension, Self-regulation

Presenting Author:Maria-Angeles Serrano, University of Valencia, Spain; **Co-Author:**Eduardo Vidal-Abarca, Universidad de Valencia, Spain; **Co-Author:**Antonio Ferrer, University of Valencia / Interdisciplinary Research Structure for Reading Research (ERI Lectura), Spain

The use of documents to perform tasks is a continuous task demand that involves making a series of decisions to self-regulate the use of text information. Many students, especially low-skilled comprehenders, have serious problems monitoring and self-regulating their decisions in these task-oriented reading situations, which has a negative impact on performance and merits instructional interventions in school settings. Intelligent Tutoring Systems (ITS) have emerged as effective tools to teach strategic skills, since they adaptively respond with individualized instruction and timely adaptive feedback, something that is not possible in large classroom settings. Herein, we present TuinLECweb, an ITS that teaches monitoring and self-regulation strategies to young adolescents. This study compares the efficacy of TuinLECweb over a classroom intervention to improve performance and strategic decisions, both in the short and in the long term. It includes a series of predictive indices, which capture readers' decisions while answering questions, that are indicative of self-regulation strategies. This study also explores the students' perceived usefulness of strategies and the characteristics of the population that obtains the greatest benefits from TuinLECweb. The results reveal that TuinLECweb training improves task-oriented reading performance and monitoring accuracy over classroom instruction; however, the differences only emerge at follow-up. Results also indicate that students perceive the strategies as more useful after training with TuinLECweb. Moderation analysis suggest that students with lower academic achievement and search behavior benefit the most from an intervention with TuinLECweb. Our results provide arguments in favor of using ITS in strategy instruction.

Session P 18

15 August 2019 15:30 - 17:00

Seminar Room - S10

Poster Presentation

Lifelong Learning, Motivational, Social and Affective Processes

Motivation and Emotion

Keywords: Achievement, Learning approaches, Lifelong learning, Mathematics, Motivation, Motivation and emotion, Primary education, Psychometrics, Quantitative methods, Second language acquisition, Self-regulation, Values education, Workplace learning

Interest group: SIG 08 - Motivation and Emotion, SIG 14 - Learning and Professional Development

Chairperson: Katrine Lindvig, University of Copenhagen, Denmark

Determining the factorial structure of the Basic Needs Satisfaction Scale

Keywords: Motivation, Motivation and emotion, Psychometrics, Workplace learning

Presenting Author:Karel Kreijns, Open University of the Netherlands, Netherlands; **Co-Author:**Arnoud T. Evers, Open Universiteit, Netherlands; **Co-**

Author:Andrea Klaijse, Expertisecentrum beroepsonderwijs, Netherlands; **Co-Author:**Joseph Kessels, Twente University - Open University, Netherlands

Self-determination theory (SDT) purports that the satisfaction of three basic needs – competence, relatedness, and autonomy – will promote intrinsic motivation

and well-being. A number of instruments — referred to as basic needs satisfaction scales (BNS-Ss) — currently exists to measure needs satisfaction; all of them assume a correlated three-factor model. However, it is not known whether a second order model or bi-factor model would produce a better fit. Therefore, we investigated the psychometric properties of each of the three models. The results revealed the correlated three-factor model as the best fit model. This means that current analyses involving BNS-Ss need not to be re-analyzed because they use the correct correlated three-factor model.

The influencing factors of Hungarian senior learners' language learning motivation

Keywords: Lifelong learning, Motivation, Quantitative methods, Second language acquisition

Presenting Author:Emese Schiller, Eötvös Loránd University, Hungary; **Co-Author:**Helga Dorner, Central European University, Hungary

This paper focuses on senior learners' motivations for language learning. It investigates the influencing factors concerning their motivational intensity. A questionnaire was designed and used with Hungarian senior students (with the average age of 65) learning English as a Second Language (SL). The instrument was designed based on Gardner's (1985) socio-educational model and Tremblay and Gardner's (1995) model of SL motivation. Thirty volunteers took part in this phase of the study, which was conducted with the aim to explore the most significant features of Hungarian senior language learners' motivational behaviour. Findings reveal that *attitude towards learning the SL* as well as *goal specificity* belong to the most influencing factors regarding the motivational behaviour of the elderly. We acknowledge the limitations of this small-scale study. We underline that this is the entry point in the validation process of the questionnaire which will be used on a large sample in Autumn 2019.

The impact of uncertainty on proactive work behaviour: the role of motivation

Keywords: Lifelong learning, Motivation, Quantitative methods, Workplace learning

Presenting Author:Leonie Jacob, University of Regensburg, Germany; **Co-Author:**Vasudha Chaudhari, Open University, United Kingdom; **Co-Author:**Regina Mulder, University of Regensburg, Germany; **Co-Author:**Allison Littlejohn, Open University, United Kingdom

The finance sector as a dynamic workplace is influenced constantly by developments in society, such as Brexit that cause ambiguity for the people working in that domain. In line with the theoretical frameworks of the Person-Environment Fit Theory and the Motivational Theory of Life-Span Development, perceived environmental uncertainty (PEU) results in a misalignment between professionals and their work environment and triggers a need for action to constitute congruency again. A cross-sectional survey study that is currently running among finance professionals in Germany and the UK is part of a collaborative research project between The University of Regensburg (GER) and The Open University (UK) is investigating how finance professionals perceive they are working under conditions of uncertainty take action to shape their work in a proactive way. The poster focusses on the relationship between PEU at work and finance professionals' PWB and the effect of motivation and PE fit as mediating factors in the British and the German finance sector. In the survey, we use the Vignette Technique to test the mediating relationships between PEU as a complex, dynamic, context-bound construct and finance professionals' innovative work behavior, self-regulated learning, and job crafting as components of proactive work behavior (PWB). We anticipate PEU will predict PWB in the finance sector significantly. We also expect PEU to derive insights into how the person-environment fit can be fostered and how training can encourage proactivity at work, now and in future.

Do the subjective task values affect work avoidance goal?

Keywords: Achievement, Motivation, Self-regulation, Values education

Presenting Author:Hisashi Uebuchi, Waseda University, Japan; **Co-Author:**Hidenori Takehana, Waseda University, Japan

This study's purpose was to explore the reasons affected the work avoidance goal. In this study, the subjective task values were focused as the reasons. 124 college students participated the survey. At the results, Interest value predicted work avoidance goal, and interest value and WA had significant effects on superficial-level strategies. It was found that because some students do not have interest in academic task, they dislike academic work or to use deep-level learning strategies. Then, they usually used superficial-level learning strategies rather than deep-level strategies. So, in order that unmotivated students felt volition, we need to make academic tasks more interesting.

Motivation and emotions in mathematics in elementary school

Keywords: Mathematics, Motivation, Motivation and emotion, Primary education

Presenting Author:Filipa Dinis, ISPA - Instituto Universitário / CIE - ISPA (Research Center in Education), Portugal; **Co-Author:**Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal; **Co-Author:**Ana Carolina Neves, ISPA - Instituto Universitário / CIE - ISPA (Research Center in Education), Portugal; **Co-Author:**Carolina Costa, ISPA - Instituto Universitário / CIE - ISPA (Research Center in Education), Portugal; **Co-Author:**Lourdes Mata, ISPA - Instituto Universitário / CIE - ISPA (Research Center in Education), Portugal

This study aimed to analyse grade related differences regarding motivation and emotions. in mathematics in 3rd, 4th, 5th and 6th grade students. Participants were 815 children (402 boys and 413 girls) who answered the Mathematics Motivation Scale (MMS) and the Achievement Emotions Questionnaire – Elementary School (AEQ-ES). MANOVAs were used to investigate the effect of school grade over the different motivation and emotion dimensions. The results showed a statistically significant effect of school grade in students' experienced emotions related to math, with positive emotions levels decreasing and negative emotions levels increasing as the school grade was higher. The same effect was found on students' motivation, with older students reporting lower levels of intrinsic value, utility value and competence self-beliefs; costs tended to maintain relatively stable, despite students' school grade. This results will be discussed based on the expectancy-value and control-value theories.

Motivational interviewing for improvement of learning strategies: a short intervention

Keywords: Achievement, Learning approaches, Motivation, Motivation and emotion

Presenting Author:Åge Diseth, University of Bergen, Norway

Motivating students to improve their study effort and learning strategies may be a challenge. However, it may be useful to let the students explore and resolve their ambivalence regarding whether to change their own learning strategies. As such, it is important to explore advantages and disadvantages with different courses of action. This is the starting point of the Self-Administered Motivational Interview (SAMI) (Duffy & Rimmer, 2008). The SAMI is designed in accordance with principles from motivational interviewing (Rollnick & Miller, 1995) as a brief intervention to improve students' learning strategies and achievement. The present study reports findings from quantitative and qualitative data on 16 university students responding to the SAMI by means of SurveyMonkey (2012). Analysis of responses showed a great diversity regarding the extent to which they were concerned about their own performance, satisfaction with their own learning strategies, whether they thought they would be able to change strategies, and how they perceived participation in the SAMI intervention as beneficial for their own learning. The students also produced a considerable amount of qualitative response data when they reported ambivalence and suggestions for actions they can take in order to improve their own learning. In accordance with previous research findings (Duffy, Houston & Rimmer, 2010) the SAMI is considered as a cost effective means of improving students' learning strategies which may contribute to transformed patterns of learning and behavior among students.

Session P 19

15 August 2019 15:30 - 17:00

Seminar Room - S16

Poster Presentation

Cognitive Science, Culture, Morality, Religion and Education, Higher Education, Instructional Design, Teaching and Teacher Education

Learning, Teaching and Instruction

Keywords: Action research, Biology, Cognitive skills, Communities of practice, Comprehension of text and graphics, Conceptual change, Content analysis, Conversation/ Discourse analysis, Experimental studies, Misconceptions, Mixed-method research, Morality, Multimedia learning, Primary education, Problem

solving, Qualitative methods, Quantitative methods, Social interaction, Social sciences, Synergies between learning teaching and research, Teacher professional development, Teaching approaches, Technology

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 03 - Conceptual Change, SIG 04 - Higher Education, SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education, SIG 17 - Methods in Learning Research

Chairperson: Paul Hennissen, Zuyd University of Applied Sciences, Netherlands

Discursive constructions on links to professional practice and research in engineering education

Keywords: Communities of practice, Conversation/ Discourse analysis, Synergies between learning teaching and research, Teaching approaches

Presenting Author: Marie Magnell, KTH Royal Institute of Technology, Sweden

Based on the ideal by von Humboldt, research and teaching are intimately linked in higher education (Östling, 2018). Aside from this ideal, in engineering education, which is the focal point of this study, there are concurrent expectations for including connections to professional practice for example from industry (Magnell, Geschwind, & Kolmos, 2017). These ideals and assumptions, however, are handled differently in different engineering programmes (Magnell & Kolmos, 2017). The aim of the present study is to probe more thoroughly into these differences and to identify academic staff's discursive constructions related to teaching links to professional practice and to research respectively. To collect data, interviews will be conducted with academic staff in three different engineering programmes, lectures will be observed, and programme presentations and course syllabuses will be collected during autumn 2018. A discourse analysis (Potter & Wetherell, 1987) will be conducted on interview transcripts, field notes, programme presentations and course syllabuses. Tentative results show different discursive constructions related to links to professional practice, to research, and to a blend of both, in which different aspects are valued and considered to be important.

Teachers' Perception of Professional Ethics and Morality

Keywords: Mixed-method research, Morality, Qualitative methods, Quantitative methods

Presenting Author: Davaajav Purejav, University of Szeged, Hungary; **Co-Author:** Edit Katalin Molnár, University of Szeged, Hungary

Teachers have heavy responsibilities as professionals and moral educators. In several countries, teachers have defined their codes of ethics, including principles of behaviour to students, parents, colleagues, self-conduct and values. However, there is little research on their adherence to these standards. In some countries, there is a code of ethics for educators, but teachers may be unaware of its implications. The aim of the present study was to use mixed methods to explore the perception and evaluation of teacher behaviours which can be regarded as problematic or unlawful. A sample of N=148 Mongolian English language teachers were selected to avoid possible variance due to different subject fields. This paper discusses three questions from the study. Frustrating issues for teachers were mapped with an open-ended question, using content analysis. Forty-three items of morally questionable or illegal behaviours were identified and included. Their frequency of occurrence and their acceptability were rated on five-point Likert scales. The responses (N=338) detailing frustrating professional issues formed six themes: problems with learners (20.41%), problems with other teachers (5.91%), problems with parents (5.91%), school level issues (24.85%), system level issues (41.42%), and unclassifiable issues (1.47%). The means of frequencies and acceptance were consistently below the mid-point. The correlations of these two variables were moderate for all items (.34 < r

Reflective process of pre-service teachers who watch video recordings of lessons they taught

Keywords: Action research, Social interaction, Teacher professional development, Technology

Presenting Author: Gila Zilka, Bar-Ilan University, Israel

Using video to record lessons conducted by pre-service teachers is easier today than it was in the past, opening the possibility opens for them to observe themselves and learn from their videotaped lessons. In this study, we examined how classroom video recording affected the reflective process, self-efficacy, and a sense of threat/challenge of pre-service teachers, from the point of view of social emotional learning (SEL). The sample of this mixed-method study included 300 Israeli. Measurements were taken at two points. It was found that watching the video recording allowed many of the respondents to observe their behavior patterns. Respondents stated that it was difficult for them to ignore aspects they were not comfortable facing otherwise. Most respondents claimed that this was the best and most accurate method for them. We found that there was a positive change in the quality of social-emotional discourse of pre-service teachers and in their sense of ability to conduct such discourse. There is a change in awareness of their feelings and of the feelings of others. There has been a change in their self-confidence, sense of personal identity, and in their emerging professional identity. It is recommended that all teachers have the opportunity to watch a video recording of their lessons and experience a reflective process that may lead to a change in behavior patterns.

Strategies in logical reasoning in a deductive version of the Mastermind game

Keywords: Cognitive skills, Experimental studies, Problem solving, Quantitative methods

Presenting Author: Maartje Raijmakers, University of Amsterdam, Netherlands

Logical reasoning is a complex ability that receives little attention in primary school. Monitoring students' improvements (xxx et al., 2013) shows that they learn to solve advanced reasoning problems by training in an adaptive environment offering only the correct solution as feedback. A logical model of the task based on Analytic Tableaux (Gierasimczuk et al., 2013) predicts multiple strategies of collecting the information to construct the solution. The aim of this study was to investigate whether adult individuals develop and adapt these strategies with increasing experience in a deductive reasoning task. 23 first-year students performed both a working memory- and a deductive reasoning task, while their eye-movements were recorded by an eye-tracker. The analysis of the scanpath is based on a new, validated method. Analysis of the scanpath revealed two solution strategies, one, the least efficient, strategy is collecting information top-down. The most efficient strategy is to focus only on the relevant information and directly constructing information.

The use and challenges of different representations in economic education

Keywords: Comprehension of text and graphics, Content analysis, Multimedia learning, Social sciences

Presenting Author: Malte Ring, University of Tübingen, Germany; **Co-Author:** Taiga Brahm, University of Tübingen, Germany

Different representations, such as graphs, diagrams, concept maps are more and more common in contemporary society. Students today are confronted with visual display of information not only in education but also in their everyday life through different (social) media. There is an ongoing debate in regard to the relationship between content of representations and representational competence (RC) – i.e. the ability to work with representations in a meaningful way. Most studies that examine students' representational competence are within the STEM-domains. This study, however, seeks to analyse representations and their (domain) specific difficulties in economic education. It aims to find out how representations are used in economic education and what particular difficulties occur when students work with visualizations of different kind. In a qualitative approach, we analysed representations used in textbooks and conducted teacher interviews with 10 economics teachers at German grammar schools. Due to their prominent use in education and everyday life, we focus on logical depictional representations (graphs and diagrams). The results of the study will be presented at the EARLI Conference.

Evolutionary theory: A review of misconceptions and interventions in kindergarten and primary school

Keywords: Biology, Conceptual change, Misconceptions, Primary education

Presenting Author: Rachel Schwager, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Lennart Schalk, PH Schwyz, Switzerland

Abstract The concept of evolution is the core of biology. It allows understanding the past and predicting the future of life. At the same time, it has massive relevance to the contemporary world and current issues which concern all of us (e.g., multi-resistant germs). But, the concept is difficult to grasp. Research has shown that children and adults show a variety of persistent misconceptions. However, a systematic overview of misconceptions is still lacking. We provide a systematic review about naïve conceptions and misconceptions about evolution and trait progression. The literature about misconceptions frequently emphasizes that it might be beneficial to induce a conceptual change by targeted intervention early on. In our systematic review, we therefore also include an overview of potential instructional approaches that have been suggested for kindergarten and primary school (e.g., the use of picture story books). We provide an evaluation of their effectiveness to foster conceptual change in the understanding of evolution.

Session P 20

15 August 2019 15:30 - 17:00

Seminar Room - S02

Poster Presentation

Assessment and Evaluation, Cognitive Science, Educational Policy and Systems, Motivational, Social and Affective Processes

Assessment, Evaluation and Tools

Keywords: Achievement, Assessment methods and tools, Competencies, Cooperative/collaborative learning, Educational attainment, Geography, Intelligence, Language (L1/Standard Language), Meta-analysis, Motivation, Problem solving, Problem-based learning, Quantitative methods, Quasi-experimental research, Science education, Secondary data analysis, Social aspects of learning and teaching, Student learning

Interest group: SIG 01 - Assessment and Evaluation, SIG 25 - Educational Theory

Chairperson: Tuire Palonen, University of Turku, Finland

Uncovering The Key Elements of Success and Failure in Complex Problem Solving: A Log-file Analysis

Keywords: Competencies, Problem solving, Problem-based learning, Science education

Presenting Author: Björn Nicolay, University of Luxembourg, Luxembourg; **Co-Author:** Florian Krieger, University of Luxembourg, Luxembourg; **Co-Author:** Charalampia Lagou, University of Luxembourg, Luxembourg; **Co-Author:** Samuel Greiff, University of Luxembourg, Luxembourg

Complex problem solving (CPS) is a transversal skill in the 21st century and has gained a lot of attention in educational settings. It requires the manipulation of variables in a novel, complex, dynamic, and intransparent environment in order to achieve a certain goal state. Previous research has shown that strategic behavior is a key component for successfully solving a CPS task. However, while ample evidence for the benefit of applying single strategies exists, previous studies have seldom analyzed the interplay of using multiple strategies in conjunction. In addition, there is a dearth of evidence whether simply applying a particular strategy is sufficient for success in CPS, or if rather additional higher-order processes, such as metacognition, represent the true decisive elements of success and failure in CPS beyond strategic behavior. The present study set out to close these research gaps by analyzing the log-files of a large-scale dataset ($N = 1,559$) of Finnish high school students working on multiple CPS tasks. Results indicate that the mere application of a certain strategy does not represent the most critical aspect for success or failure. Instead, the findings suggest that an ability to find a rationale behind one's strategy use appears to be a key element for CPS performance. Implications on how concepts such as metacognition are related to this key element are discussed, in addition to suggestions for the implementation of future CPS training programs in educational settings.

Intelligence and Domain-Specific Knowledge: A Meta-Analysis

Keywords: Achievement, Intelligence, Language (L1/Standard Language), Meta-analysis

Presenting Author: Tobias Heltemes, University of Trier, Germany; **Co-Author:** Michael Schneider, University of Trier, Germany

Many researchers have conceptualized intelligence as domain-general reasoning abilities. However, some recent frameworks of intelligence have included domain-specific knowledge as a sub-dimension of intelligence or conceptualized intelligence as separate from, but an important predictor of, domain-specific knowledge. Accordingly, many empirical studies have investigated the relation between intelligence and domain-specific knowledge. Methodical and conceptual differences between these investigations led to heterogeneous results, so the strength of the relation remains unclear. This meta-analysis compared the relation between intelligence and domain-specific knowledge from 69 articles reporting 566 effect sizes. The mean correlation was $r = 0.397$, 95% CI [0.310, 0.483], indicating a medium to strong positive relation between intelligence and domain-specific knowledge. Moderator analyses revealed a strong correlation ($r = 0.489$) between crystallized intelligence and domain-specific knowledge, highlighting the conceptual overlap of both constructs. Intelligence was as strongly associated with STEM-knowledge (science, technology, engineering, mathematics) as with knowledge in the language domain (e.g. reading, writing). Our results highlight the strong association between intelligence and domain-specific knowledge across various measures and knowledge domains. We conclude from our meta-analysis, that intelligence and knowledge cannot be equated and have substantial conceptual and empirical overlaps. Thus, standardized intelligence tests are useful tools for predicting knowledge in many domains and settings.

Long-term Trajectories of Academic Performance in the Context of Social Disparities

Keywords: Geography, Quantitative methods, Quasi-experimental research, Social aspects of learning and teaching

Presenting Author: Martin J. Tomasik, University of Zurich, Switzerland; **Co-Author:** Laura A. Helbling, University of Zurich, Switzerland; **Co-Author:** Urs Moser, University of Zurich, Switzerland

This study used a stratified random sample of classes in Zurich, Switzerland, comprising about $N = 2,043$ students whose academic performance in math and language was assessed across primary and lower secondary education. Based on this longitudinal data, the study investigated the association of social inequalities with the baseline of and gains in academic performance. The focus was on growing social disparities in academic performance during compulsory education, taking into account disparities in the social backgrounds of students as well as in social deprivation of school attendance areas. Using multilevel growth curve analysis, modelling academic performance development at student and school district levels, the results suggest cumulative disadvantages for students from lower socio-economic backgrounds. They (1) start school with lower initial knowledge and (2) experience lower improvements in academic performance. The findings also suggest that (3) more advantaged school attendance areas achieved higher average performance levels in the early stage of primary education even when controlling for student socioeconomic backgrounds. On average, however, this gap in academic performance between more advantaged and more deprived attendance areas did not appear to be widening over the subsequent years of compulsory schooling.

Comparing performance of collaborative problem-solving in Chinese-speaking economies in PISA 2015

Keywords: Competencies, Cooperative/collaborative learning, Problem solving, Secondary data analysis

Presenting Author: Man-kai leong, University of Macau, Macao; **Co-Author:** Kwok-cheung Cheung, University of Macau, Macao; **Co-Author:** Pou Seong Sit, University of Macau, Macao; **Co-Author:** Soi-kei Mak, University of Macau, Macao

Collaborative problem-solving (CPS) is increasingly envisioned as one of the most important 21st century skills in the workplace of contemporary societies. However, there is as yet a dearth of studies researching into the core competences effecting CPS performance of Chinese-speaking economies. Programme for International Student Assessment (PISA) 2015 Study, for the first time in its history assessed 15-year-old students' competence to investigate how examinees collaborate with teammates to solve complex real-life problems on computers. Conversation-based assessment with virtual computer agents were employed to assess the core CPS competencies deployed in the problem-solving processes (i.e., Exploring and understanding, Representing and formulating, Planning and executing, and Monitoring and reflecting). The three core CPS competencies assessed are: (1) Establishing and maintaining shared understanding; (2) Taking appropriate action to solve the problem; and (3) Establishing and maintaining team organization). This paper seeks to elucidate how PISA 2015 CPS measured students' CPS competencies, as well as to illustrate how to base on the log file data of sampled students' problem-solving processes to uncover the patterns of student CPS performance across countries/economies. To this end, one released test unit, XANDAR, is used to illustrate how the pertinent problem-solving processes and the three core CPS competences can be examined in large-scale international sampled surveys, alongside the comparison of the performance results of the four Chinese-speaking basic education systems, i.e., Beijing-Shanghai-Jiangsu-Guangdong (China) [B-S-J-G (China)], Chinese Taipei, Hong-Kong (China) and Macao (China) participating in the PISA 2015 CPS Study.

Advancing Item Response Technique in Educational Research

Keywords: Assessment methods and tools, Competencies, Educational attainment, Quantitative methods

Presenting Author: Agnes Tiwari, The Hong Kong Sanatorium & Hospital, China; **Co-Author:** Amanda Chu, The Education University of Hong Kong, Hong Kong; **Co-Author:** Mike So, Hong Kong University of Science and Technology, Hong Kong

The item response technique (IRT) is based on the construction of statistical models that can account for the uncertainty of individuals' response to various

items/questions, and is a useful approach in educational research. One important objective of the IRT is to estimate the unobservable characteristics of individuals via the modeling of item responses. A classical version of the IRT, called Rasch analysis, is a benchmark approach using a two-parameter statistical model. Our research includes two advancing approaches of the technique in educational research. First, we adopted the Rasch analysis to examine interviewer bias in the assessment of candidates for nurse training using the multiple mini-interviews (MMI). In this research, we aim to demonstrate how we collected the data through the MMI and conducted the analysis to measure the performance of the interviewers in terms of how tough or lenient they are as judges together with the effect of gender, time, and assessment category on the measure values. Second, once the candidates are selected for nurse training, we plan to develop a statistical model of the IRT to keep track of their knowledge acquisition, the latter has long been considered as challenging in nursing education as it requires the estimation of multi-dimensional latent traits. We expect that the IRT can be used to keep track of each student's knowledge acquisition by assessing longitudinally their cognitive competencies in the nursing-related domains as well as the generic skills such as critical thinking.

The curricular fit theory of motivation

Keywords: Achievement, Assessment methods and tools, Motivation, Student learning

Presenting Author:Rob Kickert, Erasmus University Rotterdam, Netherlands; **Co-Author:**Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:**Karen Stegers-Jager, Erasmus MC, Institute of Medical Education Research Rotterdam, Netherlands; **Co-Author:**Peter Prinzie, Erasmus University Rotterdam, Netherlands; **Co-Author:**Lidia Arends, Erasmus University Rotterdam, Netherlands

Curricula consist of three primary elements: objectives, instruction, and assessment. The instruction and assessment are educators' ways to motivate students to learn and to perform. We propose that the degree of alignment between instruction and assessment plays a crucial role in student motivation. In case of perfect alignment, all learning would have an equal chance of being assessed. As a result, motivation to learn and motivation to perform would be equivalent in terms of both performance and learning, as learning is a prerequisite to pass the assessment. However, a certain degree of cognitive and operant misalignment of assessment and instruction is inevitable. Hence, some learning that is intended by the curriculum will not need to be mastered in order to pass assessments. Consequently, a distinction arises between assessed and unassessed learning, and only the assessed learning aids performance. Thus, students who focus their effort primarily on the assessed learning, have better chances of performing well on assessments than students who evenly spread their effort between the assessed and unassessed learning. Therefore, alignment becomes relevant for students' motivation, as students who are primarily motivated to perform, have a motivation that fits in a misaligned educational context. A necessary condition for misalignment to affect motivation is the expectation of misalignment by the student. Therefore, we suggest various possible sources of student expectations of misalignment. Finally, we discuss some theoretical and practical consequences of our theory of motivation.

Session P 21

15 August 2019 15:30 - 17:00

Seminar Room - S07

Poster Presentation

Assessment and Evaluation, Motivational, Social and Affective Processes

Motivation, Attitudes and Beliefs

Keywords: Achievement, Attitudes and beliefs, Cognitive development, Cognitive skills, Competencies, Developmental processes, Educational Psychology, Experimental studies, Intelligence, Mathematics, Metacognition, Motivation, Motivation and emotion, Psychometrics, Self-regulation, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Susan Bridges, The University of Hong Kong, Hong Kong

Do beliefs about intelligence mediate the link between perceived competence and school outcomes?

Keywords: Achievement, Attitudes and beliefs, Intelligence, Motivation

Presenting Author:Therese Bouffard, Université du Québec à Montréal, Canada; **Co-Author:**Elizabeth Parent-Taillon, Université du Québec à Montréal, Canada; **Co-Author:**Carole Vezeau, Cégep Régional de Lanaudière, Canada

The objective of this study was to examine whether an incremental theory of intelligence can mediate the link between self-evaluation bias of competence and academic outcomes. 496 students were met when they were at secondary 1 or 2 (T-1) and again two years later (T-2). Partial mediation effect of incremental theory was found on self-report of test anxiety at T-1 and T-2 and of motivation at T-2 only. Incremental theory was positively linked to teachers' rating of students' motivation, self-regulation and achievement at T-1, but there was no mediation effect on either variable. However, at time 1, partial mediation effect of incremental theory was found on every variable. Post hoc hierarchical regression analyses to explore the strength of the mediation effect reveal that all effect sizes were small and never exceed 2% of the total variance explained by the bias of self-evaluation. Although holding an incremental theory does not reduce substantially the importance of the link between biased self-evaluation of competence and academic outcomes, students with a strong negative bias of self-evaluation may benefit from growth-mind-set interventions. Future research should explore this issue.

Shared antecedents of negative self-evaluation bias of competence and impostorism in students

Keywords: Attitudes and beliefs, Cognitive development, Competencies, Developmental processes

Presenting Author:Elisa Grenon, Université du Québec à Montréal, Canada; **Co-Author:**Therese Bouffard, Université du Québec à Montréal, Canada

The main goal of this study spanning four consecutive years was to explore personal and familial characteristics potentially shared by negative self-evaluation bias of academic competence and impostorism in high school students. More specifically, this study aimed to examine if parental overprotection, conditional parental support, test anxiety, sensitivity to errors and self-esteem could combine in different ways to uniquely predict each of these phenomena in students. At T1, personal and family characteristics were measured in 648 students in first or second grade of high school. In the three following years, their negative self-evaluation bias and impostorism were assessed. This study used latent profile analysis to examine relationships between resultant profiles of family and personal characteristics at time 1 and negative self-evaluation bias and impostorism at time 2, 3 and 4. A 2-profile solution provided the best fit to the data. One profile was characterized as "negative". This group reported high parental overprotection, high conditional parental support, high test anxiety, high sensitivity to errors and low self-esteem. The other profile was characterized as "positive" and presented more favorable personal and family characteristics: low parental overprotection, low conditional parental support, low test anxiety, low sensitivity to errors and high self-esteem. At time 2, 3 and 4, negative self-evaluation bias and impostorism were both predicted by the "negative" profile of personal and family characteristics. In sum, this study shows that negative self-evaluation bias and impostorism have common family and personal predictors. However, these predictors do not combine in different ways to uniquely predict these two phenomena.

Effects of Praise in Daily Friendship Situation: Effects on Mindsets and Motivation

Keywords: Educational Psychology, Experimental studies, Motivation, Motivation and emotion

Presenting Author:Kyosuke Kakinuma, Doshisha University, Japan; **Co-Author:**Ayumi Tanaka, Doshisha University, Japan; **Co-Author:**Fumika Nishiguti, Doshisha University, Japan; **Co-Author:**Kotoe Sonoda, Doshisha University, Japan; **Co-Author:**Haruhi Tajiri, Doshisha University, Japan

Much research has shown that receiving and offering effort-focused praise encourages the growth mindset and persistence following failure, whereas receiving and offering ability-focused praise discourages the same. The effect of praise has been noted to differ depending on the situation. However, many praise studies have focused on praise only in academic achievement scenarios. Therefore, the present study aimed to examine the effect of effort- and ability-focused praise in daily friendship situations. We conducted a scenario-based experiment with 271 undergraduates. The participants were randomly assigned to six groups comprising a 2 (receiving or offering praise) × 3 (effort-focused praise, ability-focused praise, or no praise) design. The results showed that both receiving and offering effort-focused praise positively affected the growth mindset significantly and had an indirect positive effect on persistence, although ability-focused praise affected neither mindset nor persistence. Thus, effort-focused praise in daily friendship situations would have a similar effect on belief and motivation as does praise in academic situation. These findings have important implications for the role of praise; further studies are needed to shed light on the effects of

ability-focused praise in daily friendship situations.

Help Seeking, Epistemological Beliefs, and Motivational Beliefs in (Pre)vocational Students

Keywords: Attitudes and beliefs, Motivation, Self-regulation, Student learning

Presenting Author:Florinda Sauli, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Jean-Louis Berger, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Matilde Wenger, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Valentin Gross, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland

Understanding students' self-regulation of learning, particularly why, how, and when they use learning strategies, is highly relevant to developing students' life-long learning abilities. In the present study, we analyzed how students' epistemological and motivational beliefs were correlated with help seeking (HS) for 273 (pre)vocational students learning math. The main results showed that there are only slight differences between vocational and prevocational students; a desirable HS profile (low threat and a high tendency to seek instrumental help) is associated with epistemological and motivational beliefs. More specifically, concerning epistemological beliefs, when a student think that the structure of math is complex and that the ability to learn it is innate and the less s/he also believe that math is certain, simple and quickly acquired. With regard to motivational beliefs, a desirable HS profile is related to low perceived costs in learning math (both in terms of giving up other activities and efforts). Thus, the study sheds light on how students learning math self-regulate their learning processes according to epistemological and motivational beliefs. These results can help teachers in better conceiving their teaching.

High, average, and low achievement in Mathematics: Metacognitive, motivational and emotional aspects

Keywords: Achievement, Mathematics, Metacognition, Motivation and emotion

Presenting Author:Dimitrios Moustakas, University of Macedonia, Greece; **Co-Author:**Eleftheria Gonida, Aristotle University of Thessaloniki, Greece; **Co-Author:**Dimitrios Goudiras, University of Macedonia, Greece

It is not that long ago that achievement in Mathematics was studied via a holistic approach including metacognitive, motivational and emotional aspects. The present study aimed to examine high, average and low achievement in Mathematics within this approach. A sample of 237 9th graders participated in the study, and their performance in Mathematics was assessed with a battery of school-type mathematical tasks. Participants were also asked to complete a number of 5-point Likert type scales measuring their metacognitive awareness, their motivational beliefs (expectancies, values and cost) and six class-related achievement emotions (enjoyment, pride, anxiety, anger, boredom, and shame). Based on their performance, students were classified into four groups: High achievers (20%), average to high achievers (34%), average to low achievers (26%), and low achievers (20%). Data analyses indicated non-significant differences among the first two groups of students in regard to the metacognitive, motivational and emotional variables, whereas significant differences were found mostly between high and low achievers as well as between the first two (above average to high) and the last two groups (below average to low). The results are discussed in terms of a multicomponent profile of high and low achievers in Mathematics including metacognitive, motivational and emotional aspects, and educational implications for supporting students of different achievement level are pointed out.

Measuring Critical Thinking and Metacognition among Students in Technical College

Keywords: Cognitive skills, Metacognition, Motivation and emotion, Psychometrics

Presenting Author:Felipe López, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Miguel Nussbaum, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Mayra Contreras, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Damian Gelerstein, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Pablo Chiuminatto, Pontificia Universidad Católica de Chile, Chile

Although there are studies that look at how to develop Critical Thinking and Metacognition, there are very few on how to assess them. The aim of the present study is to look at how critical thinking and metacognition can be assessed among students belonging to the poorest quintile of society, characterized by their poor performance on national standardized tests and low level of reading comprehension. 57 students, from students of a technical college in Santiago de Chile, were measured using the sub-skills interpretation, analysis, inference, evaluation, reasoning, and metacognition. Results show that it is possible to create an instrument to measure critical thinking in the defined conditions, and revealed the importance of *Conation*. When analyzing the differences between the expert and peer corrections, we saw that the students' attitude was more important than their abilities, both in terms of reading comprehension as well as prior knowledge.

Session P 22

15 August 2019 15:30 - 17:00

Seminar Room - S11

Poster Presentation

Assessment and Evaluation, Cognitive Science

Cognitive Development and Skills

Keywords: Cognitive development, Cognitive skills, Developmental processes, Educational Psychology, Experimental studies, Intelligence, Language (L1/Standard Language), Literacy, Mathematics, Motivation, Second language acquisition, Self-regulation, Writing/Literacy

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 05 - Learning and Development in Early Childhood, SIG 12 - Writing

Chairperson: Molly Hammer, University of Tuebingen, Germany

Children's knowledge of multiple word meanings: Devising a receptive test of polyseme vocabulary

Keywords: Cognitive development, Cognitive skills, Language (L1/Standard Language), Second language acquisition

Presenting Author:Sophie Booton, University of Oxford, United Kingdom; **Co-Author:**Victoria Murphy, Open University, United Kingdom

Little is known about how children learn words with multiple senses. This is partly due to a lack of validated receptive tests of polyseme vocabulary for children. In this study, a pictorial multiple-choice test of receptive polyseme vocabulary suitable for children aged 6 -10 years – the Receptive Polyseme Vocabulary Test (RPVT). The RPVT consisted of 50 items in which children were presented a polyseme (e.g. 'school') and required to select two images that matched two different meanings of that polyseme (e.g. for 'school', a school with children, and a group of fish) from an array of six images. The test was given to 31 children in an initial study to assess the validity of the test and its sensitivity in older and younger children. Results demonstrated that performance on the RPVT related positively to age and time spent reading, and that performance was better for monolinguals than bilinguals. Children under 8 years performed above chance level, and item-level data indicated that previous tests had underestimated the performance of younger children. This research presents a methodological tool which can be used to investigate when and how polysemes are learnt in monolingual and bilingual children, and assess the impact of educational interventions that target polyseme understanding.

Early cognitive and environmental predictors of arithmetic skills at 11.5 years old

Keywords: Cognitive development, Cognitive skills, Educational Psychology, Mathematics

Presenting Author:Ava Guez, Ecole Normale Supérieure, France; **Co-Author:**Hugo Peyre, Robert Debré Hospital, APHP, France; **Co-Author:**Manuela Piazza, Neuroimaging Unit, Neurospin Center, Italy; **Co-Author:**Barbara Heude, INSERM, France

This paper aimed at understanding which are the early cognitive and environmental predictors of arithmetic abilities at the end of primary school, and to what extent the effect of environmental variables is mediated through early cognitive abilities. To do so, we analyzed newly collected longitudinal data on 348 school-aged children in France using structural equation modeling. Early language skills and visuo-spatial skills, but not fine motor skills, positively predicted performance in arithmetic at 11.5 years old. Early numerical abilities did not significantly affect later arithmetic abilities beyond the effect of domain-general skills. Among early behavioral and emotional problems, emotional symptoms were the only significant predictors of arithmetic performance. Boys had higher arithmetic results than girls, a difference that was not accounted for by differences in early cognitive skills. Alcohol consumption during pregnancy had a negative direct effect on performance at 11.5 years old. The number of siblings was negatively associated with performance, an effect which was entirely

mediated through early language skills. Lastly, parental education had a positive effect on performance at 11.5 years old, an effect which was entirely mediated through early language and visuo-spatial skills. These findings provide important insight on the mechanisms underlying the development of arithmetic abilities in children.

Belief about intelligence: its role on the link between memories of failures and academic adaptation

Keywords: Cognitive development, Intelligence, Motivation, Self-regulation

Presenting Author:Élizabeth Parent-tailon, Université du Québec à Montréal, Canada; **Co-Author:**Therese Bouffard, Université du Québec à Montréal, Canada; **Co-Author:**Carole Vezeau, Cégep Régional de Lanaudière, Canada

The objective of this study is to investigate whether an incremental conception of intelligence mediates the relation between students' bias of memory toward failure, and their self-reports and teachers' ratings of academic outcomes. 530 students (254 boys) were met in either their 5th or 6th grade (T-1) and once again the year later (T-2). At T-1, they responded to a questionnaire related to their memory of failure and success allowing to compute their memory bias. At T-2, students self-reported their implicit theories of intelligence, school motivation and test. Also at T-2, teachers were probed to assess students' motivation and self-regulation and rated their overall academic performance. Results of mediation analyses reveal that the students' incremental theory of intelligence mediates partially the relation between their memory bias toward failure and their self-report of motivation and test anxiety. However, it fully mediates the link between their bias toward memory of failure and their motivation, self-regulation and academic performance evaluated by the teachers. Findings of this study suggest that the negative effects of a bias of memory toward failure are significantly reduced when students adhere to a dynamic conception of intelligence. Thus, intervention to bring students to endorse an incremental conception of their intelligence and to see failures as opportunities to growth is likely to help struggling students deal with the challenges and threats inherent in learning environments

First-graders' updating capacity in relation to cognitive processes involved in text comprehension

Keywords: Cognitive development, Cognitive skills, Developmental processes, Experimental studies

Presenting Author:Wienke Wannagat, University of Würzburg, Germany; **Co-Author:**Gerhild Nieding, University of Würzburg, Germany

We examined, if and to what extent, updating capacity is associated with first-graders' ability to construct coherence on a local and a global level as indicators for different cognitive processes necessary for text comprehension. Local coherence refers to the process of connecting adjacent phrases with each other, while global coherence means that current information is connected to information that occurred earlier in a text, or to an overall topic. Updating capacity, as one of several executive functions of the working memory, describes the ability to update working memory content based on a specific criterion (Miyake et al., 2000), which has been shown to be associated with reading comprehension in general (e.g., Carretti et al., 2005). We assessed the construction of global and local coherence with a word-recognition task, in which the reaction times to words associated with a superordinate and a subordinate goal of a story-protagonist served as indicators for the mental representation of global and local coherence relations. To measure updating capacity, participants named the smallest object within lists of 10 words each (see Pelegrina et al., 2015). The results indicate that updating capacity seems to be relevant only for the construction of global, but not local coherence.

Investigating the L2 Writing Processes and Real-time Fluency Using Inputlog

Keywords: Cognitive development, Cognitive skills, Literacy, Writing/Literacy

Presenting Author:Meshail Almasri, King AbdulAziz University, Saudi Arabia

· The study sheds light on the importance of investigating writing processes. · The examination of writing processes provides insights into the stages that students encounter while writing. · This study uses keystroke logging to examine the composing processes pausing, revisions and L2 writing fluency (from a process-based perspective) of EFL university level students · Inputlog, L2 writing tasks and stimulated recall interviews are used. · Inputlog allows researchers to analyze the online writing procedure unobtrusively. · The study's participants are EFL preparatory-year university students enrolled in General English courses · The participants are 50; 25 in level 1 and 25 in level 4. · The participants are asked to write two task types; argumentative and descriptive and the topics are selected from their textbooks. · Each task is corrected by two EFL teachers Each student is interviewed after he/she finishes (stimulated recall interviews)

Session P 23

15 August 2019 15:30 - 17:00

Seminar Room - S09

Poster Presentation

Assessment and Evaluation, Developmental Aspects of Instruction, Instructional Design, Learning and Instructional Technology

Instructional Design

Keywords: Biology, Cognitive skills, Computer-supported collaborative learning, Content analysis, Educational Psychology, Informal learning, Instructional design, Interdisciplinary, Knowledge creation, Learning approaches, Multimedia learning, Primary education, Reflection, Science education, Secondary education, Student learning, Teaching/Instruction, Writing/Literacy

Interest group: SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Sarah Bichler, Ludwig-Maximilians-Universität (LMU), Germany

Learning and engagement evolutionary ideas within integrated informal learning environments

Keywords: Biology, Content analysis, Informal learning, Science education

Presenting Author:Orit Ben Zvi-Assaraf, Ben-Gurion University of the Negev, Israel; **Co-Author:**Dina Agadi, The Ben-Gurion University of the Negev, Israel; **Co-Author:**Yael Gavrieli, The Steinhardt Museum of Natural History, Tel Aviv University, Israel

The presentation will discuss how museums of Natural History are particularly well suited to teaching evolution, providing flexible, informal learning and extensive resources (e.g., fossils, specimens, labs). Many exhibits are devoted to the presentation of evolutionary mechanisms, ranging from evolution in microorganisms and plant life to the evolution of hominins. The research population included six groups, each made up of twenty sixth-grade gifted science students. They participated in four concentrated 'science days' in Tel-Aviv University's 'Nature Campus'. These began with an introductory activity (i.e. a lecture, examples from exhibits and computer simulations). This was followed by a hands-on inquiry workshop, in which students examine specimens from the exhibits more closely, as well as guided tours in the zoological and botanical gardens. Analysis of the group poster-making discussions and concept maps showed that these science days advanced the students' understanding of basic evolutionary patterns and processes, like the factors causing natural selection and the process of evolution of species over time. The results suggested that this designed informal learning environment encouraged students to investigate patterns and identify relationships between the environment and natural selection, and engage one another in scientific argumentation about evolution.

Using Meta-strategy to Deepen Students' Understanding of Knowledge Building in Science Class

Keywords: Computer-supported collaborative learning, Instructional design, Knowledge creation, Reflection

Presenting Author:Lillian Liu, The University of Hong Kong, Hong Kong; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Yuyao Tong, The University of Hong Kong, China

This study developed and implemented a meta-discourse strategy in a knowledge building environment, to facilitate students' collective responsibility for sustained inquiry and scientific understanding. The aims of this study are: 1) to investigate the changes in students' Knowledge Forum discourse [network] change and how was it related to meta-discourse pedagogy; 2) to capture and characterize how students developed their discourse and understanding of KB using meta-discourse strategies. This study was conducted in a Grade 7 science classroom for five weeks. Findings suggested students gained gradually deeper understanding of discourse processes and community processes through reflective and meta-strategies. Student's metacognition and reflection are also

captured, and several key themes were identified.

Comparison of experiments and computer simulations as learning tools for out-of-school education

Keywords: Interdisciplinary, Multimedia learning, Science education, Student learning

Presenting Author:Johanna Krüger, Leibniz Institute for Science and Mathematics Education at Kiel University (IPN), Germany; **Co-Author:**Tim Hoeffler, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Katrin Knickmeier, Kieler Forschungswerkstatt, Germany; **Co-Author:**Martin Wahl, Helmholtz-Zentrum für Ozeanforschung Kiel, GEOMAR, Germany; **Co-Author:**Ilka Parchmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

In a series of two studies hands-on experiments and an interactive computer simulation concerning the future of the Baltic Sea will be investigated as learning tools for secondary level students. Both methods are based on real scientific results and have different advantages and disadvantages regarding to motivational and cognitive processes. In study I a comparison of both methods points out positive effects due to working on experiments compared to a computer simulation concerning the content knowledge, situational interest, manageability, utility and cognitive load. Study II investigates the combined effects of the two methods with newly developed experiments and a simulation.

Benefits of task contextualization: What is the effect of interest on the learning outcome?

Keywords: Cognitive skills, Instructional design, Learning approaches, Primary education

Presenting Author:Sebastian Kempert, University of Potsdam, Germany; **Co-Author:**Ann-Kathrin Laufs, University of Potsdam, Germany

Interest represents an important factor in learning processes across various domains. As previous findings indicate the significance of interest in learning processes on both an affective and cognitive level, taking the learner's interests into account appears to be a fruitful approach to support the learner individually. However, empirical studies regarding the underlying cognitive mechanisms are rare and have produced inconsistent results. In the present study we investigate within a pre-post-intervention design whether task contextualization within subjectively interesting areas (TG) influences positively the educational output compared to non-contextualized tasks (CG). We assume that subjectively interesting tasks are associated with elements of prior knowledge. Drawing on these knowledge representations leads to a lower demand on working memory resources. Any unexploited resources can then be used for other relevant tasks within the learning process. The content of the tasks is the Control of Variables Strategy i.e. the competence to comprehend a controlled experiment. Due to the sample composition, with regard to sociodemographic factors we ensured to have a diverse sample of third- and fourth-graders (n=200). Having collected extensive data regarding working memory capacity and cognitive abilities as independent variable and control variable, the results of this study may generate profound insights to the cognitive effects on learning processes. All data will be addressed via multivariate analysis.

Recovery Effects in German Orthography Acquisition

Keywords: Educational Psychology, Instructional design, Teaching/instruction, Writing/Literacy

Presenting Author:Julia Erdmann, Ruhr University Bochum, Germany; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

Widespread German orthography instruction methods encourage children to write words in their own idiosyncratic way with the help of a phonetic table. Orthographical correctness is not emphasized by these methods and children are not corrected for a prolonged time period. It is reasonable to assume that when children have to learn the correct spelling later, interference will occur between the already established memory trace and the new memory. The goal of the present study is to investigate whether recovery effects – which have been demonstrated in basic research on extinction learning – similarly occur in the context of orthography instruction methods with delayed correction. In particular, we hypothesize that even if erroneous spellings have seemingly been extinguished, they may reappear later in students' spellings in the form of recovery effects (spontaneous recovery). In the present study, we test this hypothesis in a maximally controlled laboratory setting.

Engaging Students in Theory Building in the Science Classroom

Keywords: Instructional design, Knowledge creation, Science education, Secondary education

Presenting Author:Hillary Swanson, Northwestern University, United States; **Co-Author:**Uri Wilensky, Northwestern University, United States

Theory is central to science. Yet, little curriculum is devoted to helping students learn to build theory. Given the centrality of the practice, we argue it is important to think about how we might integrate theory building into the curriculum. In this paper, we explore two approaches to scientific theory building that have been shown to productively engage students as early as middle school. In the first approach, students create a theory of a pattern observed at the macroscopic level of a system. In the second approach, students develop a computational model to explain a macro-level pattern by specifying the micro-level interactions. We describe the two approaches and compare them in terms of the products the students create, the processes through which they create them, and their affordances for learning.

Session Q 1

15 August 2019 17:15 - 18:45

Lecture Hall - H04 - Knorr-Bremse Hörsaal

SIG Invited Symposium

Learning and Social Interaction

SIG 16: Parent and Child Factors associated with Self-Regulation in (Early) Childhood

Keywords: Cognitive development, Developmental processes, Goal orientation, Metacognition, Parental involvement in learning, Reflection, Self-efficacy, Self-regulation, Social aspects of learning and teaching

Interest group: SIG 16 - Metacognition

Chairperson: Miriam Compagnoni, University of Zurich, Switzerland

Chairperson: Kim Gärtner, Heidelberg University, Germany

Organiser: Miriam Compagnoni, University of Zurich, Switzerland

Organiser: Kim Gärtner, Heidelberg University, Germany

Discussant: Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

Early self-regulation is a key predictor for successful learning and adjustment to school. In order to understand how self-regulation develops across early childhood, parent and child characteristics that might exert an influence need to be considered. While some factors, such as high (parental) self-efficacy, child-parent relationship quality or positive self-concept, are assumingly beneficial for early self-regulation skills, others are considered controversial, such as the inaccurate estimation of one's abilities, or even unfavorable, for instance, parenting stress. However, more research is needed on the interplay of these factors. Our symposium gives new insight into the early development of self-regulation by building on cross-sectional and longitudinal research, taking into account the child and parent perspective, targeting an age range from toddlerhood to primary school, and including a clinical sample of preterm born children. The first paper examines the interplay of kindergarteners' overestimations, underestimations, and realistic estimations of their preacademic abilities with behavioral self-regulation and goal orientation. The second paper investigates if school-age children's monitoring and regulation are based on actual task experiences or on children's past judgment, and discusses how teachers can best support children in their self-regulated learning. While the third paper then examines the interaction of parenting stress and parent-child interaction quality with child self-regulation in a non-clinical sample of school-age children, the fourth paper explores how parenting practices, self-efficacy beliefs and parenting stress relate to toddler's self-regulation in both full- and preterm born children. Theoretical and practical implications can be derived to support children's self-regulation at an early stage.

"I am the best!": Preacademic self-concepts and self-regulation in kindergarten children

Presenting Author:Miriam Compagnoni, University of Zurich, Switzerland

Academic self-concepts are considered to be motivational beliefs with great significance for academic learning. In educational research and practice, fostering

high and optimistic self-concepts is often described as desirable. However, findings on overestimation as a powerful bias, and literature on self-regulated learning, highlight the importance of realistic self-concepts. The ability to accurately evaluate one's performance seems crucial for appropriate and challenging goal-setting, and sets effective behavioral self-regulation (SR) processes in motion. In research about kindergarten, little importance has been given to academic self-concepts due to the strong positive bias of children, and links with goal-orientation and behavioral SR, as important predictors of school success, are rarely investigated. The present cross-sectional study aims to explore the relation of kindergarten children's preacademic self-concepts (accuracy, overestimation, underestimation and realistic estimation) to goal-orientation and behavioral SR. Preacademic self-concepts of 147 kindergarten children ($M = 6.47$ years, $SD = 0.39$ years) were assessed individually with a comparative standard. By means of residual scores, the extent of overestimation and underestimation was determined in relation to teachers' achievement ratings on the same scales. Although the self-concept was positively biased, it was significantly related to teacher's ratings. Independent of the achievement level, the results showed that the more accurate the estimation, the more the children tended towards mastery goal orientation (vs. performance goal orientation). For low achievers, realistic estimations are linked with better behavioral SR than misestimation. Given the lack of research on self-concepts and SR in kindergarten children, this study offers important insights and expands current knowledge.

Children's Monitoring and Regulation of Learning: Consistency Across Tasks and Stability over Time

Presenting Author: Mariette van Loon, University of Bern, Switzerland; **Co-Author:** Martina Steiner, University of Bern, Switzerland; **Co-Author:** Natalie Bayard-Guggisberg, University of Bern, Switzerland; **Co-Author:** Claudia Roebbers, University of Bern, Switzerland

Children's monitoring and regulation of learning are often not based on actual task experiences and insights into performance. Instead, monitoring and regulation may be consistent across tasks and stable over time. This study investigated consistency and stability of 2nd and 4th grade children's monitoring and restudy. Participants were 304 children (2nd grade $n = 139$; 4th grade $n = 165$), they were tested at two time points that were half a year apart, once in fall (at the beginning of the school year, T1), and once in spring (at the end of the school year, T2. Both at T1 and T2, children completed a comprehension task (text learning) and a memory task (Kanji learning). Both tasks consisted of four phases: Study, test, monitoring, and regulation. Monitoring and regulation seemed stable over time and consistent across domains. Monitoring at T2 was predicted by one's monitoring judgments that were made half a year earlier. As well, children's percentage of restudy at T2 were predicted by restudy half a year earlier. One's past judgments and restudy decisions seemed stronger predictors of monitoring and regulation than one's actual task performance. This may indicate that children base their monitoring judgments and restudy selections on an 'anchor', rather than on one's actual task experiences and insights into performance. To support children with self-regulated learning, teachers should help children to take valid indicators of performance into account.

The Effects of Parent Stress and Child-Parent Relationship Quality on Children's Self-Regulation

Presenting Author: Lynda Hutchinson, King's University College at the University of Western Ontario, Canada; **Co-Author:** Cassandra Trevisani, University of Western Ontario, Canada; **Co-Author:** Devon Trower, Western University, Canada; **Co-Author:** Nancy Perry, University of British Columbia, Canada; **Co-Author:** Marissa Hall, King's University College at the University of Western Ontario, Canada

Children's development of, and engagement in, self-regulation (SR) has been shown to predict success at home (Cappa et al., 2011) and in school (Perry et al., 2017). SR describes how individuals respond to environmental demands and apply effective patterns of cognition, emotion, and behaviour, to achieve goals (Perry et al., 2017). Studies have demonstrated that child-parent relationship quality is associated with children's engagement in SR (Schroeder & Kelly, 2010). However, more research is needed to better understand how additional parent factors, such as parent stress may also be linked to children's SR at home. The current study addresses this issue. Data were gathered from 87 parents (49 fathers; Mean Age = 34.16 years, $SD = 12.33$ years) and their children (64 boys; Mean Age = 6.71 years, $SD = 1.74$ years). Parents provided demographic data along with reports of their parenting stress, child-parent relationship quality, and their child's SR and temperament. A path analysis confirmed the direct and statistically significant effects of parent stress on children's SR and children's expression of negative affect. Also, child-parent conflict was a direct and statistically significant predictor of children's surgency. Finally results demonstrated that child-parent closeness was a statistically significant moderator of children's SR. The theoretical and educational significance of these findings are discussed. We illustrate a need for research which explores how the confluence of parent and teacher stress, impacts school-aged children's SR.

Self-Regulation in Full- and Preterm Toddlers – Effects of Parenting Practices, Beliefs and Stress

Presenting Author: Kim Gärtner, Heidelberg University, Germany; **Co-Author:** Verena Vetter, University Hospital Heidelberg, Germany; **Co-Author:** Michaela Schäferling, University Hospital Heidelberg, Germany; **Co-Author:** Gitta Reuner, Ruprecht-Karls-Universität Heidelberg, Germany; **Co-Author:** Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Self-regulation plays a key role for learning and academic success. Preterm born children display a heightened risk for self-regulation deficits and associated outcomes. In order to counteract adverse developmental trajectories, it is highly relevant to identify influencing factors. Parents' self-efficacy beliefs and negative co-regulation strategies have recently been shown to predict inhibitory control in full-term born toddlers. Since parents of preterm children display lower levels of self-efficacy and higher levels of stress and mental health problems, the question arises how these factors contribute to preterm children's inhibitory control, besides parenting practices. We explore how parents' positive (PCR) and negative (NCR) co-regulation strategies, domain-specific (DSSE) and domain-general (DGSE) self-efficacy beliefs, and parenting stress predict toddler's inhibitory control six weeks later. Furthermore, we examine whether this interplay differs among full- and preterm born toddlers and their parents. Results are based on 88 full-term and 53 preterm born parent-child dyads (children's (corrected) age: 24-35 months). Regression analyses with the complete sample (as well as the full-term sample alone) reveal that parents' NCR and DSSE contribute significantly to child inhibitory control. However, the effect of parents' DSSE vanishes, once parenting stress is considered. In contrast, in the preterm sample, parenting stress represents the only significant predictor of child inhibitory control. The present study adds new and important evidence on factors associated with the development of self-regulation in early childhood. Parenting interventions should not only target parenting practices and self-efficacy beliefs but also aim to reduce parenting stress in order to promote children's self-regulation.

Session Q 2

15 August 2019 17:15 - 18:45

Lecture Hall - H07

SIG Invited Symposium

Higher Education

SIG 9: Facilitating teacher insights using phenomenography and variation theory

Keywords: Higher education, In-service teacher education, Morality, Phenomenography, Pre-service teacher education, Religious studies, Science education, Student learning, Teacher professional development, Teaching approaches, Teaching/instruction, Video analysis

Interest group: SIG 09 - Phenomenography and Variation Theory

Chairperson: Jaana Kettunen, University of Jyväskylä, Finland

Chairperson: Ake Ingeman, University of Gothenburg, Sweden

Organiser: Ake Ingeman, University of Gothenburg, Sweden

Discussant: Angelika Kullberg, University of Gothenburg, Sweden

Phenomenography and variation theory have continuously contributed towards a pedagogical potential in educational settings at different levels. This symposium will focus on two strands of such contributions. The first strand will look closer at two teaching designs where the representation of the object of learning play a central role, and how such representations interplay with critical aspects. Representation often form an inherent part of how a phenomenon is understood in different disciplines, especially for complex and abstract phenomena. However, forms of representation have seldom been systematically addressed as integral to the teaching design in learning studies and analyses based on variation theory. One contribution (paper I), has in a learning study compared different ways of representing price. Another contribution (paper II) has analysed the alignment of representations and discerning relevant variation in

stereochemistry. The second strand focuses professional (teacher) education (paper III) and further development in collaboration (paper IV), explicating how and in what way teachers' knowledge may grow as the result of engaging in learning studies, finding out what works in the classroom. This includes, for example, that teachers integrate and contextualise the kind of knowledge being reported in the first strand of the symposium, making it available for their professional practice. Taken together, there are considerable implications for how to organise the teaching of specific content, as well as for facilitating the development of teaching practice for learning through cultivating a character of teaching and teaching designs that allows attending to key aspects of the content of learning.

Using visual representations to qualify students' understanding of causal relationships in price

Presenting Author:Ann-Sofie Jägerskog, Stockholm University, Sweden; **Co-Author:**Peter Davies, University of Birmingham, United Kingdom; **Co-Author:**Cecilia Lundholm, Stockholm University, Sweden

This study contributes to the understanding of how different visual representations of price facilitate learning and focuses on students in upper secondary social science education. Three introductory lessons on pricing were conducted with four classes (in all 92 students), of which two had lessons based on graphs and two on a causal loop diagram. Written responses to pre- and post-test questions were analysed phenomenographically and in relation to the visual representation used in teaching. Results suggest that students' understanding of the relationships between supply, price and demand was affected by the visual representations used in teaching. The intervention based on a causal loop diagram facilitated a more qualified way of understanding the causal relationships in pricing than the graph-based intervention. The traditional way of introducing price to upper secondary students, through the use of supply/demand graphs, is thereby problematised. The results have important implications for teaching and learning through visual representations in general and for economics teaching in particular and point to the importance of reflecting on visual representations in teaching in order to facilitate a qualified conceptual understanding. The study thereby contributes to practice as well as to theory in terms of practical implications for teaching about price to upper secondary students and in terms of expanding theory on how learning is affected by the structural composition of a visual representation.

The utility of variation theory where disciplinary relevant aspects are appresent

Presenting Author:Ake Ingerman, University of Gothenburg, Sweden; **Co-Author:**Cedric Linder, Uppsala University, Sweden; **Co-Author:**Anne Linder, Uppsala University, Sweden; **Co-Author:**Susanne Wikman, Linnaeus University, Sweden

The primary aim of this paper is to use a blending of social semiotics and the variation theory of learning to address a primary pedagogical challenge in higher education: what kinds of communicative practices can contribute to the optimization of constituting the understanding of complex objects of learning? In particular, we explore the utility of the variation theory of learning where multiple disciplinary relevant aspects are appresent for a given object of learning. This is done in the context of science education at the introductory university level using chemistry as a particular example.

To achieve this we analyze a teaching sequence focusing reading stereochemistry 2D-sketches as 3D, where key disciplinary relevant aspects (DRA) that must be noticed are appresent in the 2D semiotic format – for example, the relative orientation of different parts of a molecule. The teaching sequence is built from explicating variation along dimensions of transduction (variation relevant for the meaning of the whole) and transformation (not relevant variation for the meaning of the whole). The illustrative data comes from a five-week introductory university course on organic chemistry involving identification of molecular structures. Through close analysis of communicative action and expressions, the students' experience of the variation along these dimensions can be visibly demonstrated. The presented analysis portrays learning as an emergent property of what the students do. Further, we suggest that variation theory has much to gain from this kind of well grounded descriptions of 'what', through social semiotics, thus extending the utility of variation theory.

Beginner Teachers' knowledge of students' understandings: evidence from Learning Study

Presenting Author:Guy Durden, University College London, United Kingdom

This study offers a new perspective on the two components of Pedagogical Content Knowledge (PCK) originally identified by Shulman (1987): i) knowledge of students' specific learning difficulties and conceptions of subject phenomena and, ii) knowledge of instructional strategies. It does this by drawing on phenomenography-variation theory to research and describe qualitative differences in Beginner Teachers' conceptions of students' understandings of subject content and to provide evidence of the effectiveness of an instructional strategy that might be adopted by teacher educators based upon those conceptions (known as 'Learning Study'). The study identified nine possible conceptions of students' understanding of the topic of 'price' in economics/business education with each being divided into a structural and a contextual element. Each of these elements was found to be independently related suggesting that the development of a more sophisticated understanding can be capped without development in both dimensions. The conceptions identified provide a framework for teacher educators to conceptualise Beginner Teachers' learning about students' understanding that is easily applicable in practice. In addition, Learning Study was found to have a statistically significant, medium/large effect on the development of Beginner Teachers' knowledge of students' understandings in comparison to a control group. These results add to the evidence for adopting this approach more widely in teacher education.

Changing teaching, changing teachers: learning through contrast, generalization and fusion

Presenting Author:Keith Wood, SHBIE, UBD, Brunei Darussalam; **Co-Author:**Airi Rovio-Johansson, University of Gothenburg, Sweden

In all its adaptations, Lesson Study emphasises the use of evidence to guide teachers' collaborative reflection on what works in the classroom. Phenomenography and variation theory provide us with the tools to explore the experience of teacher learning through participation in Lesson Study. From an analysis of reports providing evidence of the experience of teacher learning voiced by teachers participating in the Learning Study (LS) adaptation of Lesson Study, we sought to identify the object of learning and the path of learning - separation, contrast, generalisation, fusion (Marton, 2015) - that led to change in the teachers' experience of teaching. We were interested also in the experience of the facilitator or coach, and in the part they play in the teacher group's pursuit of that path. Variation theory posits that, if learning has occurred, it has resulted from an experience of variation. Our question is: what is that experience of variation that leads to teacher learning through LS? In summary, we are interested to identify necessary conditions of teacher learning through participation in LS. From this study we are able to argue that LS should have a central role in initial and in-service teacher education programmes in higher education.

Session Q 3

15 August 2019 17:15 - 18:45

Lecture Hall - H10

SIG Invited Symposium

Teaching and Teacher Education

SIG 18: Feedback on teaching: Issues of conceptualization, operationalization and application

Keywords: Quantitative methods, Reflection, Teacher Effectiveness, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 18 - Educational Effectiveness

Chairperson: Wolfram Rollett, University of Education Freiburg, Germany

Chairperson: Charalambos Charalambous, University of Cyprus, Cyprus

Organiser: Wolfram Rollett, University of Education Freiburg, Germany

Discussant: Charalambos Charalambous, University of Cyprus, Cyprus

Getting feedback on teaching, reflecting on it and modifying teaching practice accordingly provides teachers with indispensable ways for developing the quality of their daily work. Despite the importance of feedback providing for developing teaching quality, several fundamental questions related to its conceptualization, operationalization and utilization remain open. This invited symposium addresses three of these questions: To what extent has theoretical work on feedback informed current operationalizations of providing feedback? How can valid feedback measures on teaching quality be derived? What factors influence the utilization of student feedback on teaching quality? The papers will give new insights into 1) how classroom observation instruments gauging feedback quality can be informed by different frameworks on feedback providing; 2) the importance of taking into account the variance of student ratings on teaching quality; 3)

typical patterns of teachers in (not) making use of student feedback; and 4) individual differences between teachers and characteristics of their workplaces that can explain the utilization of feedback on teaching quality.

Reflecting on the Promise of Classroom Observation Frameworks for Measuring Feedback Quality

Presenting Author:Merle Ruelmann, University of Teacher Education of Lucerne, Switzerland; **Presenting Author:**Charalambos Charalambous, University of Cyprus, Cyprus; **Presenting Author:**Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

Feedback providing comprises one of the most powerful instructional tools for supporting student learning and is therefore included in many observation-based instruments for measuring instructional quality. Despite its importance, capturing feedback validly in ongoing instruction poses significant challenges.

Synthesizing work on feedback providing, in this exploratory study, we first developed a list of eight categories of high-quality feedback based on prominent theoretical models on feedback. Using content analysis, we then compared these categories to 12 classroom-based observation frameworks to explore the extent to which these frameworks have been informed by pertinent literature in this area and compare how they capture this instructional aspect. Only seven frameworks attended to feedback; these frameworks differed in the number of categories captured and the depth into which they go in describing them. Interestingly, one category was not captured by any framework. Summing up, this study calls for closer links between theoretical models on feedback providing and classroom observation frameworks seeking to capture feedback. The study also highlights the importance of deeper thinking on how classroom observation instruments can be complemented with other measures to capture feedback quality more comprehensively.

Does variance in student ratings add information about teachers' teaching quality?

Presenting Author:Rikkert van der Lans, University of Groningen, Netherlands

The goal of this contribution is to explore whether the variance in student ratings may provide additional information about teachers' teaching effectiveness as well as directions for improvement. We present various results supporting the idea that disagreement in student ratings might reflect true differences in teachers' teaching effectiveness. Based on this, it is explored whether the variance in student ratings may add additional information not presented by the usually studied class average. Preliminary results based on 124 secondary teachers indicate a strong and negative correlation between the class average teaching effectiveness and student disagreement about teaching effectiveness ($r = -0.65$). A Latent Profile Analysis (LPA) further suggests that highly rated teachers are subdivided in two groups according to the variance in student ratings. The results suggest that the variance in student ratings may add additional information to teachers about current teaching effectiveness and directions for improvement.

Factors influencing the utilization of student feedback on teaching quality

Presenting Author:Hannah Bijlsma, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands

Student feedback can be valuable for teachers' professional reflection and for their professional development. To provide teachers with student feedback about a lesson just taught, the Impact! tool was developed and researched in secondary schools in the Netherlands. Teachers however do not necessarily improve teaching quality based on the student feedback. This depends on factors influencing the use of student feedback by teachers (e.g., school contextual or teacher specific characteristics). In this paper, we used data from the Impact! project to provide an in depth look into instances in which student feedback to teachers did and occasions in which student feedback to teachers did not contribute positively to the development of teaching and teachers. The results show that teachers' willingness to improve their lessons (based on the student feedback), the time and facilitation teachers receive from the school leader (to conduct improvement-oriented actions), and a feedback culture in school (where teachers feel free to talk about the student feedback with colleagues), positively contributes to the utilization of the student feedback. Learning why, how, and when student feedback is used effectively by teachers contributes to the research on the effective use of student feedback, and to educational practice.

Types of teachers in using student feedback. Quantitative and qualitative findings

Presenting Author:Sebastian Röhl, University of Education Freiburg, Germany; **Co-Author:**Wolfram Rollett, University of Education Freiburg, Germany

Several scholars describe feedback from students to teachers as a useful instrument for the professional development of teachers and the improvement of instruction. At the same time, empirical studies show a heterogeneous picture of the use of student feedback by teachers. This study uses quantitative cluster analysis to identify different types of teachers in their dealings with student feedback followed by an interview study. The sample used in the quantitative analysis consists of $n=98$ teachers working at an association of German schools where the use of student feedback is obligatory. Analysis included the level of use of the received student feedback by teachers, their attitude towards student feedback and the perception of the feedback received from their students. Five stable types could be identified, including 1) consistent positive users, 2) critical users, 3) users with a negative perception as well as 4) low-users with positive attitudes and 5) non-users with negative attitudes. Further analysis of the types focusing on occupational stress and coping behavior emphasizes a high relevance of teachers' coping capacities for their dealing with the received student feedback. The analyses of the interviews with 10 teachers confirm the quantitative typology and point to the relevance of the feedback-related intentions and the perceived need for improvement for the way student feedback is used.

Session Q 4

15 August 2019 17:15 - 18:45

Lecture Hall - H11

SIG Invited Symposium

Culture, Morality, Religion and Education

SIG 19: Worldviews and religions in education – perspectives to functions and experiences

Keywords: Attitudes and beliefs, Cultural diversity in school, Culture, Higher education, Motivation and emotion, Multicultural education, Religious studies, Teaching/instruction

Interest group: SIG 19 - Religions and Worldviews in Education

Chairperson: Elina Kuusisto, University of Humanistic Studies, Netherlands

Organiser: Laura Hirsto, Finland

Discussant: Alexander Unser, TU Dortmund University, Germany

This invited symposium of SIG 19 aims at investigating how worldviews impact people's motivation to learn, how worldviews guide people's life choices and future orientation, and how worldviews and religions help people to find meaning in life. Worldviews are often considered to be sets of beliefs and assumptions that describe reality. However, worldviews have been researched from various perspectives and through various theoretical constructs. Worldviews have been in the interest of the theology and humanistic studies, but various researchers have called for better understanding of the worldview functions also in the field of psychology (e.g. Hirsto, 2001; Koltko-Rivera, 2004; Rauste-von Wright, 1986). Also, Park considers worldview perspectives as fundamental in the meaning making system. Worldviews may affect people's choices explicitly or implicitly. In analyzing theoretically the meaning making process, Park (2010) divides between global meaning making and situational meaning making processes. According to Park (2010) global meaning making refers to beliefs about self, world and oneself in the world, as well as goals and subjective sense of meaning or purpose. In Parks (2010) theoretical perspective personal worldview is important in the meaning making process. This invited symposium will bring together perspectives of the meaning of worldviews and religions in teaching and learning from selected perspectives. The integrating focus will in the various perspective of the functions of religions and worldviews in teaching and learning contexts.

Religious and professional beliefs of schoolteachers – a literature review of empirical research

Presenting Author:Manfred L. Pirner, University of Erlangen-Nuremberg, Germany; **Co-Author:**Nastja Häusler, University of Erlangen-Nürnberg, Germany

This paper provides an overview of the current research status on possible relations between teachers' personal religious or worldview beliefs and their professional thinking and acting. The major underlying hypothesis is that teachers' religiosity or worldview orientation has an impact on their teaching. Although

this hypothesis has been the basis of much public dispute on various issues, there has been little scholarly attention to and empirical research in this field – particularly in Europe. This paper aims to summarise and systematise relevant recent research and discourse. After some fundamental theoretical reflections on belief systems in general and religious as well as teachers' beliefs in particular we will then report empirical research findings and approaches regarding the relation between religious or worldview beliefs and professional convictions. We will do so in five thematic sections: (1) research on the religiosity of teachers (school teachers as well as university and college professors) in general, (2) research on the relation between teachers' religiosity and their attitude towards science, knowledge and science teaching, (3) research on the religious beliefs of Religious Education teachers, (4) research on faith-based schools and (5) research on teachers' religiosity as a resource for their coping with stress and difficult situations. Conclusively, we will reflect about the interaction between religious beliefs and professional contexts.

The Largely Absent Worldview needed for Understanding Global Jihadism

Presenting Author:Terence Lovat, University of Newcastle, Australia

The paper mounts an argument for "public theology", as defined, as a vital adjunct to contemporary religious education's addressing of current world events with indisputable religious and arguably quasi-theological foundations, such as Global Jihadism. It will argue that a religious education functioning in this way has potential to engender a worldview in students that can assist in their development and, especially in their understanding and better addressing of such world events. It will briefly expound on the history of thought that has marginalized theology as a public discipline, drawing especially on the work of John Henry Newman to illustrate how the demise of theology was presaged by epistemological priorities and blind spots of nineteenth-century thought and how, it will be argued, these blind spots persist unhelpfully in our current attempts to understand and manage events with religious and theological underpinnings, and furthermore in teaching about them. The paper will provide examples of such contemporary events and how these blind spots impact negatively on community understanding and in education and furthermore how these might be redressed with a fortified religious education underpinned by a public theology perspective.

Position of worldviews in education: experiences from teachers and learners

Presenting Author:Arniika Kuusisto, Stockholm University, Sweden

This study examines the position of worldviews in education from the perspectives of both teachers and learners. Using Finland as a case study context, the study presents examples from empirical studies across different age groups, from Early Childhood Education and Care (ECEC) and school to teachers and teacher educators. The position of worldviews in societal education is a topic of heated debates. In the midst of intensified cultural and religious plurality, the debate has accelerated with increased migration and the succeeding questions of integration. For example the visibility of religious symbols, the place of religion in the celebration of cultural festivities, and the meaning of 'non-confessional' in societal education have been discussed, together with the suitable approaches for teaching about worldviews in societal education. The here presented mixed methods data includes e.g. surveys (N=1800), interviews, observation, and focus groups. The findings illustrate the diversity of influences that children draw from when constructing their worldviews. They also point to variation in age, gender, and geographical location in pupils' openness to worldview diversity in educational settings. The educator experiences illustrate the diversity in policies and practices of dealing with worldview related matters, and an emphasis to supporting children's growth and development as literacies and competences for living in a diverse society, when it comes to the aims and functions of societal education on religions and worldviews.

University students' personal worldviews –contextual experiences

Presenting Author:Laura Hirsto, University of Helsinki/ University of Eastern Finland, Finland

The aim of this study was to investigate higher education students' experiences of the teaching and learning environment provided by their faculty in relation to their personal worldview. Earlier research support the theoretical idea that religious questions are intertwined in the personal worldviews and values of students, and affect their motivational constructs. The two investigated student groups were theology students and teacher education students. Calling is often referred as an important motivation to aim for as well theological profession as teacher education. According to results, theology students experienced that their personal worldviews had affected their goals and that they were more committed to their personal worldview than teacher students. However, teacher students reported significantly higher certainty of their career choice. Among teacher education students, gender differences in how students' experienced that they were committed to their personal worldview in the extent that their personal worldviews had affected their goals. The effects of personal worldview on goals and commitment to ones' personal worldview varied significantly in terms of majority, minority and non-religious groups among both teacher education students and theology students. Group of religious minority students in teacher education and theology experienced that their personal worldview had affected their goals most often. Members of majority and non-religious groups thought differently of the importance of the privacy of personal perspectives on religion and spirituality. Experienced certainty of career choice varied significantly between minority and majority groups only among theology students.

Session Q 5

15 August 2019 17:15 - 18:45

Seminar Room - S16

Single Paper

Learning and Social Interaction

Social Interaction in Learning and Instruction

Keywords: Conversation/ Discourse analysis, Informal learning, Literacy, Out-of-school learning, Parental involvement in learning, Qualitative methods, Science education, Social interaction, Teaching/instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Erkkka Laine, University of Turku, Finland

"You see the cup? I put the bill inside" Hybrid discourse in family everyday science engagement

Keywords: Conversation/ Discourse analysis, Informal learning, Science education, Social interaction

Presenting Author:Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel

Engagement with science in everyday family life plays a crucial role in children's development of science knowledge, skills, attitudes, and identity. While we know a lot about the discourse that characterizes science classrooms, we lack a good understanding of the discourse that supports (or hinders) engagement with science in the home. In this study, I investigate the role discourse genres play as discursive resources supporting or hindering engagement with science in everyday family life. I explore what genres are enacted, how, by whom, when, and how weaving genres together supports or hinders engagement with science. Drawing on data collected through self-ethnography, this case study follows one family over the course of one year, during which 305 science engagement events were audio-recorded by the mother (the author), resulting in a corpus of 27 hours of family conversations, and complemented by written diary entries. The analysis employs linguistic ethnographic methods, including systematic scanning of the entire data corpus and detailed micro-analysis of select events. Initial findings reveal prominent discourse genres, including *for example*: scientific genres, classroom genres, magic-trick genre and sports announcing genre. Micro-analysis shows how discourse genres were often weaved together, serving as a resource that supported and hindered science engagement. This study advances our understanding of science engagement in everyday family life, highlighting the complex role of discourse genres. It provides rich accounts of everyday discourse "in the wild", with implications for how to support science engagement at home.

"Pull the rope!" –Identity and embodied positioning in a science museum

Keywords: Informal learning, Out-of-school learning, Science education, Social interaction

Presenting Author:Neta Shaby, Ben-Gurion University of the Negev, Israel; **Co-Author:**Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel

The science education community is increasingly concerned with the development of science identities, and defines it as a primary educational goal, related to

science career aspirations. Informal learning environments are perceived as providing students with unique learning opportunities, including opportunities to identify with science in ways that are usually not afforded in science classrooms. Conceptualizing identity as fluid, situated, and constructed through activity, analysis of identity often highlights talk as a central modality of identification, and seldom attends to embodied positioning. In this study, we explore how the physical and the pedagogical design of an informal environment affords student physical interaction, embodied positioning and development of a science identity. We analyze videotaped observations of students visiting a science museum in six school field trips over the course of three years (4th to 6th grade) focusing on embodied interactions. The analysis reveals that only the less structured environment (the exhibition hall) allowed students to take on roles and positions that are different from the classroom, highlighting the role of embodied positioning in identification processes. Our analysis emphasizes the physical setting of the exhibit and the nature of the activity (free choice) as key contributors to these shifts. This study offers new understandings of the unique affordances of informal environments to science identity development, with implications for physical and pedagogical design.

Episodes of Error Correction in Bar-Mitzvah Torah-Reading Tutoring Sessions

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social interaction, Teaching/instruction

Presenting Author: Hadar Netz, Tel Aviv University, Israel; **Co-Author:** Orna Fogel, Tel Aviv University, Israel

This study offers a discourse analysis of correction episodes in Torah (Pentateuch) reading tutoring sessions, conducted in preparation for the Bar-Mitzvah ceremony in the synagogue. Four sessions with four tutors and four pupils were recorded, transcribed, and analyzed. A total of 227 correction episodes were found in the corpus. Quantitative analysis indicated that more than two-thirds of the tutors' corrective feedback was terminal (i.e. word supply), and less than a third sustaining (i.e. prompt). Terminal feedback resulted in successful repair of the trouble source about 90% of the time, whereas sustaining feedback only around 60% of the time. However, qualitative micro-analysis revealed that this apparent effectiveness of terminal feedback was usually short-lived, as the pupils typically repeated the original errors soon after their successful repair. The study also indicates that tutors praise infrequently, but when they do provide praise, this alleviates the face threat involved in corrective feedback, and therefore facilitates learning.

Investigation of parents' use of Parent Assisted Interactive Reading (PAIR) books

Keywords: Conversation/ Discourse analysis, Literacy, Parental involvement in learning, Social interaction

Presenting Author: Elisabeth Duursma, University of Wollongong, Australia; **Co-Author:** Sarah Howard, University of Wollongong, Australia; **Co-Author:** Karl Maton, University of Sydney, Australia; **Co-Author:** John Walters, independent author, Australia

Parent-child bookreading benefits children because the talk accompanying the interaction promotes early language and literacy skills and can contribute to children's reading achievement (Read, Macauley, & Furay, 2014). Parent Assisted Interactive Reading (PAIR) books offer a great opportunity for parents to engage their children in interactive reading as the books provide parents with scaffolding (in the form of questions, tips and prompts) embedded in each page (Piscean Publishing, 2016). The aim of this study is to explore how parents and young children respond to the PAIR books. Thirty-nine Australian families with children ages 3-8 were videotaped while reading two PAIR books. Preliminary results demonstrated a variety of engagement by parents with the PAIR books. Many parents used some, but not all of the questions in the book. When parents were more focused on reading the text and asked only closed-ended questions, children were less likely to elaborate on the answers. Parents who were actively engaged in the story by asking not only the 'suggested' questions but also adding their own thoughts, tended to have children who responded in a similar way and created an interactive discussion. The next stage of coding will focus on Specialization, Semantics and Autonomy dimensions from Legitimation Code Theory or LCT (Maton, 2016). LCT is a sophisticated framework for exploring practices in terms of their organising principles (legitimation codes), which specifically address practices and their relation to knowledge. This analysis will consider implications these may have on parents' reading and children's learning.

Session Q 6

15 August 2019 17:15 - 18:45

Seminar Room - S07

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Argumentation, Dialogue and Reasoning

Keywords: Argumentation, Cognitive skills, Conversation/ Discourse analysis, Design based research, Educational Psychology, Ethnography, Higher education, History, Literacy, Pre-service teacher education, Reasoning, Secondary education, Social aspects of learning and teaching, Social interaction, Student learning

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Cornelis de Brabander, Leiden University, Netherlands

What does the silence mean? Student non-participation in classroom discourse: reasons and effects

Keywords: Ethnography, Social aspects of learning and teaching, Social interaction, Student learning

Presenting Author: Klara Sedova, Masaryk University, Czech Republic; **Co-Author:** Jana Navrátilová, Masaryk University, Czech Republic; **Co-Author:** Zuzana Salamounova, Department of Educational Sciences, Faculty of Arts, Masaryk University, Czech Republic; **Co-Author:** Roman Švaříček, Masaryk University, Czech Republic

Student participation in classroom discourse is an important source for their learning. In this contribution, we focus on non-participating students and we strive to explain why they talk rarely in the classroom and what are the consequences of their communicative behavior. We conducted an ethnographic research in four Czech lower secondary classrooms. The data we analyzed comprised six video recordings of language lessons, two interviews with teachers, and four interviews with students in each classroom. Our analysis shows that silence has different consequences for high-achieving and low-achieving students. High-achieving students use silence to gain exclusive opportunities for learning and to construct and maintain the social position of extra capable students. Low-achieving students are excluded from communication, do not gain relevant learning opportunities, and their silence is interpreted as a sign of their incompetence.

Reliable epistemic processes in academic historiography

Keywords: Cognitive skills, Educational Psychology, History, Reasoning

Presenting Author: Mikko Kainulainen, University of Turku, Finland; **Co-Author:** Marjaana Puurtinen, University of Turku, Finland; **Co-Author:** Clark A. Chinn, Rutgers University, United States

Many current approaches to history education draw conceptual and practical implications from expert historiography. These instructional approaches ground on research findings about historians' epistemic practices. So far, the empirical scholarship on these practices has highlighted practical engagements with historical sources. However, historiography involves many other processes before, after, and during reading and writing. Therefore, we present an investigation into the reliable epistemic processes of academic historians. In order to explore the possibility of a broader scope of epistemic processes, we interviewed twenty-six academic historians about their situated epistemic practices. Preliminary results significantly extend previous findings about historians' epistemic processes. Our findings also contribute to discussions of how historiography is mediated by various means, such as languages, digital tools, and publication structures. By detailing historians' epistemic practices systematically, these results contribute to future work on developing history education as well as historical theory.

Talk about Texts in New Zealand Secondary School

Keywords: Conversation/ Discourse analysis, Design based research, Literacy, Secondary education

Presenting Author: Aaron Wilson, University of Auckland, New Zealand

The aim of this study was to investigate and improve patterns of talk about text (TaT) in subject-specialised Year 12 classrooms. The two-year design-research study was a partnership between the author and six teachers of English, biology, chemistry, health, and physical education from two urban high schools in New

Zealand (NZ) that serve low socio-economic status communities. The first phase was a profiling phase to identify existing patterns of talk about text and factors teachers and students identified as constraints and enablers. The second phase involved the co-design of an intervention which focused on teacher facilitated talk about text sets in small groups.

Diagnostic activity patterns of pre-service teachers in learning with case-simulations

Keywords: Argumentation, Higher education, Pre-service teacher education, Reasoning

Presenting Author: Elisabeth Bauer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:** Michael Sailer, Ludwig-Maximilians-Universität, Germany; **Co-Author:** Claudia Schulz, Technische Universität Darmstadt, Germany; **Co-Author:** Jan Kiesewetter, University Hospital of LMU Munich, Germany; **Co-Author:** Martin R. Fischer, University Hospital of LMU Munich, Germany; **Co-Author:** Ilyna Gurevych, Technische Universität Darmstadt, Germany; **Co-Author:** Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Until now, research on the nature and appropriateness of diagnostic processes in pre-service teachers has been scarce. The current study addresses this gap by analyzing pre-service teachers' patterns of diagnostic activities during their learning with case-simulations. Learners' diagnostic activity patterns are compared to patterns found in medical education research. We used the method of Epistemic Network Analysis to create network graphs depicting single learners' diagnostic activity patterns. Moreover, a comparison plot was generated that indicates an overall network and the variance between learners' single networks. Preliminary results suggest that some diagnostic activity patterns from medical education replicate in our data. High variance was found in the comparison plot, indicating that learners did not use a specific diagnostic activity pattern predominantly. Further analyses will address a comprehensive clustering of all learners' diagnostic activity patterns. The results pose questions regarding pre-service teachers' professionalization of diagnostic activities.

Session Q 7

15 August 2019 17:15 - 18:45

Seminar Room - S15

Single Paper

Higher Education

Qualitative Methods in Higher Education

Keywords: Assessment methods and tools, Content analysis, Doctoral education, Higher education, Qualitative methods, Reflection, Researcher education, Synergies between learning teaching and research, Teacher professional development

Interest group: SIG 01 - Assessment and Evaluation, SIG 14 - Learning and Professional Development, SIG 24 - Researcher Education and Careers

Chairperson: Allyson Holbrook, The University of Newcastle, Australia

Professional Growth in Research Supervisors' Pedagogical Content Knowledge as Result of Lesson Study

Keywords: Content analysis, Higher education, Qualitative methods, Teacher professional development

Presenting Author: Bas Agricola, Amsterdam University of Applied Sciences, Netherlands; **Co-Author:** Marieke Van der Schaaf, University Medical Centre Utrecht, Netherlands; **Co-Author:** Frans Prins, Utrecht University, Netherlands; **Co-Author:** Jan van Tartwijk, Utrecht University, Netherlands

Lesson study is a professional development program that combines teachers' active engagement and observation of teachers' lessons. During a lesson study teachers collaborate in a lesson study team. In this study, four participating research supervisors have developed, taught, evaluated and redesigned a supervision meeting with a focus on undergraduate students' research skills. During so-called research lessons, supervisors experimented with open questioning and giving positive feedback instead of giving instruction and explanations. As a result, the participating supervisors expected their students to substantiate, argue, and consider the choices they made. We aimed to identify the impact of this lesson study approach on research supervisors' professional development and specifically on their pedagogical content knowledge (PCK) as most important learning outcome. Triangulation by method was applied to measure supervisors' learning outcomes and learning activities; learning reports, videotaped lesson study meetings, and exit interviews were analyzed on indicators of change (e.g. 'I have learned'). Coding results showed two different learning outcomes and four different learning activities. Each learning outcome, and the corresponding activities were connected to the four domains of the Interconnected Model of Professional Growth. Different pathways for each supervisor's PCK were determined by constructing pictorial representations per supervisor. This study shows that lesson study is a promising professional development method that can have an impact on research supervisors' PCK. Our supervisors followed different pathways of PCK change, in which the learning activities of considering your own practice and getting ideas from others contributed the most to these changes.

Ethical issues in conducting insider research in academic workplaces: challenges and opportunities

Keywords: Higher education, Qualitative methods, Reflection, Synergies between learning teaching and research

Presenting Author: Irina Lokhtina, University of Central Lancashire Cyprus, Cyprus

This paper explores the ethical issues faced by a researcher interviewing participants who work in the same field. The paper draws on the study that was conducted to explore academics' lived experiences of community relations in Cypriot public universities by taking into consideration the impact of power inequalities and access to resources through the lens of the situated learning theory. The data were generated through in-depth semi-structured interviews with twenty academics. Potential ethical dilemmas connected to the chosen methodology (e.g. gaining access to academics; choosing alternative methods to generate narrative accounts; building trust; protecting participants' anonymity) as well as an exploration of the context in which the study was undertaken required from the researcher a high degree of self-reflexivity. This paper examines the responses to ethical dilemmas and the rationale for choosing qualitative methods while protecting participants' privacy and anonymity and explore researcher 'reflexivity' as a tool for (re)constructing academic identity. The paper concludes that the values and practices that sustain trust and collaboration between the researcher and the participants in doing insider research can create a critical and supportive dialogue that enhances the conduct of participants' enterprise by giving them a sense of ownership of it. The significance of insider research, when conducted in a rigorous and thoughtful manner, is in its reflective nature which allows constructing a more critical understanding of the studied phenomena that it is impossible without identities shifting. This has implications for those who undertake insider research and those who train novice researchers.

Feedback practices within PhD supervision: a framework-based synthesis of the literature

Keywords: Assessment methods and tools, Doctoral education, Higher education, Qualitative methods

Presenting Author: Joanna Tai, Deakin University, Australia; **Co-Author:** Margaret Bearman, Deakin University, Australia; **Co-Author:** Rachelle Esterhazy, University of Oslo, Norway; **Co-Author:** Michael Henderson, Monash University, Australia; **Co-Author:** Elizabeth Molloy, University of Melbourne, Australia

This literature review aims to identify key features of feedback practices within doctoral supervision as reported in qualitative studies. A PhD candidate is heavily dependent on their supervisors' judgements about their work and subsequent communications of how to improve. However, there appears to be little acknowledgement of feedback conceptualisations outside of the transmission approach within the doctoral supervision literature. Contemporary higher education literature suggests new ways of thinking about and enacting feedback, which may provide valuable insights for how to improve doctoral supervision. Moreover, the supervisory relationship may provide insights as to how to improve feedback in general higher education. A comprehensive literature search resulted in a 42 papers, which were qualitatively analysed using a framework-based synthesis approach. Analysis suggests a rich tapestry of feedback practices categorised by: sociocultural influences; individual influences; relational aspects; personal responses; materialities; and temporalities. These reveal ways in which feedback in doctoral supervision could be enhanced including: the student taking more control over information about their work; ensuring many sources of feedback information beyond the supervisor; and developing supervisors' understanding of feedback processes. The findings also suggested higher education feedback in general could benefit from strongly relational forms of feedback, which unfolded over repeated episodes of work, embedded in pedagogy and practice.

Doctoral students' professional development: a conceptual change approach to program evaluation

Keywords: Doctoral education, Higher education, Qualitative methods, Researcher education

Presenting Author: Helga Dörner, Central European University, Hungary; **Co-Author:** Swapna Kumar, University of Florida, United States

This paper outlines findings from a research project on how graduates of a professional development program perceive of the program elements, its effects and of the changes in their teaching practices; and how they reflect on pedagogical knowledge transfer. The study was conducted with the aim to also explore conceptual change experienced and shared by participants. Twenty-two doctoral students who graduated from the program were interviewed. The transcripts were analyzed using the Constant Comparative Method. As found, varying degrees of conceptual change have been triggered by the program in the following three areas: (1) evolving critical reflection on disciplinary teaching strategies or signature pedagogies (2) developing an openness to embrace pedagogical innovation; and (3) rethinking the importance and relevance of teaching by exploring reflective practices in professional development. Multidisciplinarity and collaboration with peers and instructors were identified as catalysts for conceptual change.

Session Q 8

15 August 2019 17:15 - 18:45

Seminar Room - S13

Single Paper

Learning and Social Interaction

Methods in Learning Research

Keywords: Competencies, Conversation/ Discourse analysis, Distributed cognition, Higher education, Knowledge creation, Mixed-method research, Professions and applied sciences, Qualitative methods, Social aspects of learning and teaching, Social development, Social interaction, Video analysis, Vocational education

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Gwendolin Blossfeld, University of Bamberg, Germany

Exploring learning relationships in “a mixed way”: Mixed Structural Analysis

Keywords: Mixed-method research, Qualitative methods, Social aspects of learning and teaching, Social interaction

Presenting Author: Dominik E. Froehlich, University of Vienna, Austria

In this presentation, I will show how Mixed Structural Analysis (MSA), a newly developed mixed variant of Qualitative Structural Analysis (QSA; Herz, Peters, & Truschkat, 2014), can be applied to investigate social relationships in quantitative and qualitative terms. In short, QSA is a method applied within the framework of social network analysis (Borgatti, Mehra, Brass, & Labianca, 2009), which is based on interview transcripts and network maps (concentric circles; Kahn & Antonucci, 1980) that are created ad-hoc during the interviews. While this does allow for an informative qualitative analysis of the interview data, I purport that replacing the ad-hoc network maps with a quantitative pre-survey has important advantages. First, the sampling procedure for the (cost-intensive) interviews is more informed. By adding a standardized quantitative survey upfront (cf. sequential explanatory designs; Creswell, 2009), the researchers are able to invite interviews that are more likely to be fruitful in terms of the research question (e.g., in terms of focusing on contrasting or similar cases). Also, this makes the research process more economical, as the likelihood of interviews that do not add a lot of interesting new data is decreased. Second, by having quantitative and qualitative components, the potential for common method bias is reduced (Podsakoff, Mackenzie, & Podsakoff, 2012). This is even more true when the quantitative component is executed long before the potential interviews, allowing to triangulate the data across time.

Cross-year peer assisted learning and the development of social skills

Keywords: Competencies, Higher education, Mixed-method research, Social development

Presenting Author: Caroline Buts, Vrije Universiteit Brussel (VUB), Belgium; **Co-Author:** Mariane Frenay, Université catholique de Louvain (UCL), Belgium

Multiple surveys and studies emphasise that there is currently insufficient focus on the development of social skills in university education. Following a broad stakeholder consultation, we introduce a new elective course, i.e. 'student-assistant', to partly fill a gap regarding social and transferable skills in the economics programmes. Master students assist for bachelor courses with a low study yield by developing a valuable set of complementary activities, providing additional guidance. This article constitutes a partial evaluation of the project and reviews whether it indeed contributes to the development of social and transferable skills for master students. The analysis is based on multiple interview rounds, evaluation forms, reflection reports from the master students and feedback from the participating course holders. We find that the types of activities trigger the development of different skills. Hence, participating master students develop a relatively varied set of skills, ranging from planning and interpersonal communication to confidently addressing a large audience. In addition, master students clearly develop preferences for those activities where they have most autonomy regarding content and organisation. Interestingly, these are also the activities that are most appreciated by bachelor students.

The relationship between theory and practice in T-VET. On the grounds of key actors' perspectives.

Keywords: Distributed cognition, Professions and applied sciences, Qualitative methods, Vocational education

Presenting Author: Mariana Orozco, University of Antwerp, Belgium; **Co-Author:** David Gijbels, University of Antwerp, Belgium; **Co-Author:** Christiane Timmerman, University of Antwerp, Belgium

The integration of theoretical and practical knowledge appears as an anchor of today's technical vocational education and training (T-VET) and as a major determinant of continuing professional development. Understanding such integration is expected to contribute to the advancement of pedagogical approaches, and to provide new research tools and perspectives. A first step to disentangle integration in T-VET is to understand how micro-level actors conceive theoretical knowledge, practical knowledge and, certainly, the relationship between them. The present investigation consists of an in-depth qualitative study designed to reveal students, tutors and mentors' negotiated epistemological conceptions and beliefs. Thirty-eight subjects in dual-T-VET in the field of chemical process technology participated in serial and single focus groups. These actors' subjective and intersubjective views on the theory-practice relationship were mapped using the grounded theory approach. This paper advances three maps depicting: (a) several forms of knowledge responding to conceptions of theory or to conceptions of practice, (b) the relationships between those forms of knowledge in terms of activities, and (c) the multiple agents responsible for accomplishing each connecting activity. In sum, the findings reveal a possible expression of the overall 'integration of theory and practice' in terms of a network of relationships that approach multiple forms of knowledge to each other, and that are embodied by multiple agents. Finally, this study provides a rationale for continuing research on integration that is framed on a networked conceptualisation of integration as well as on an inferentialist, non-dualistic approach to the theory-practice relationship.

New approach to educational interaction: sociocultural discourse analysis meets multimodal analysis

Keywords: Conversation/ Discourse analysis, Knowledge creation, Mixed-method research, Video analysis

Presenting Author: Alison Twiner, The Open University, United Kingdom; **Co-Author:** Caroline Coffin, The Open University, United Kingdom; **Co-Author:** Karen Littleton, Open University, United Kingdom; **Co-Author:** Denise Whitelock, Open University, United Kingdom

This paper presents an original and innovative methodological combination, as a means to explore and research teachers' and pupils' educational use of resources, in the unfolding, dialogic, mediated, multimodal and often unexpected processes of meaning-making. The proposed methodological combination harnesses the advantages of sociocultural discourse analysis (SCDA; Mercer, 2004), and multimodal analysis (drawing on Jewitt, 2009; Kress & van Leeuwen, 2001). Broadly speaking SCDA combines qualitative analysis of lesson extracts – e.g. picking up on dialogue and interactions around contextualised use of resources or activities over time – with corpus linguistic analysis of full lesson transcripts – e.g. identifying keywords within a series of lessons or highlighting patterns in teacher and pupil talk over time. Multimodal analysis is based on highly detailed transcription of video recordings, presented as series of annotated stills to form short extracts. We argue that using this methodological combination opens a new, exciting and insightful space and lens to attend to the unfolding, sometimes cumulative dialogue, within and across lessons, alongside bodily enactment and embodiment of evolving conceptual understanding. It also allows

attention to breaks in continuity and flow of educational interactions, and how these are repaired by teachers and pupils in constructing meaningful knowledge together—to zoom in and zoom out along the detail and trajectory of teaching and learning events. The original contribution of this approach is significant in offering a tool for researchers to exemplify best practices and evidence common challenges within educational practice, as well as researching educational interactions that are increasingly multimodal in nature.

Session Q 9

15 August 2019 17:15 - 18:45

Seminar Room - S04

Single Paper

Higher Education, Learning and Social Interaction

Educational Psychology

Keywords: Argumentation, At-risk students, Educational policy, Educational Psychology, Mixed-method research, Peer interaction, Science education, Social aspects of learning and teaching, Social interaction

Interest group: SIG 08 - Motivation and Emotion, SIG 15 - Special Educational Needs, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Claudia Kastens, Bergische University Wuppertal, Germany

Exploring UK international student experiences during times of home-country conflict

Keywords: At-risk students, Educational policy, Educational Psychology, Mixed-method research

Presenting Author: Emily-Marie Pacheco, University of Glasgow, Canada

The present study explores the effects of indirect exposure to trauma on international students through a psychological lens. Specifically, this study investigated the experiences of Syrian international students who have been affected by the active armed-conflict in their home country while studying in the United Kingdom. While the number of international students in British Higher Education institutions continues to grow, matters concerning the wellbeing of this increasingly diverse population continues to be of utmost importance. As there has been little research on the experiences of international students during times of home-country crisis, and less concerning vicarious traumatization in populations of civilians while abroad, the current study looks to bridge these two literatures and contribute a foundation for understanding the effects of these unique situations on the psychological wellbeing of these under-investigated populations. An inductive approach using Interpretive Phenomenological Analysis (IPA) was employed, and Syrian international students (n=15) were interviewed semi-structurally. Analyses identifies and explores the common stressors and risk factors faced by the Syrian international student population, while also highlighting the common coping-mechanisms used to maintain psychological homeostasis. The present study therefore looks to contribute novel yet vital insights to the literature, for the future benefit of at-risk international students via informed educational policy and resource development. **Keywords:** Mixed-methods research, phenomenography, educational psychology, at-risk students, social sciences, higher education, motivation and emotion. Wordcount: 207

Collaborative and individual argumentation don't differ at prompting natural selection understanding

Keywords: Argumentation, Educational Psychology, Peer interaction, Science education

Presenting Author: Antonia Larrain, Universidad Alberto Hurtado, Chile; **Co-Author:** Paulina Freire, Universidad Alberto Hurtado, Chile; **Co-Author:** Sebastian Verdugo, Universidad Alberto Hurtado, Chile; **Co-Author:** Marisol Gómez, Universidad Alberto Hurtado, Chile; **Co-Author:** Patricia López, Universidad Alberto Hurtado, Chile; **Co-Author:** Diego Cosmelli, Pontificia Universidad Católica de Chile, Chile; **Co-Author:** Valeska Grau, Pontificia Universidad Católica de Chile, Chile

Peer argumentation, especially the discussion of contrary points of view, has experimentally been found to be effective in promoting science content knowledge, but how this occurs is still unknown. In particular, the role of peer interaction and relevant feedback and/or instruction has been less well attended. We conducted a study whose aim was to evaluate the use of argumentation, in both peer and individual settings, in promoting middle-school students' understanding of natural selection. In total 137 sixth-grade students attending 7 public schools in [CITY, COUNTRY] participated in the study under 1 of 4 conditions: oral argumentation with peers (39); written individual argumentation (29); oral non-argumentative elaboration with peers (36); and written individual elaboration (31). Students were randomly assigned to one of these conditions in each participating school. In all the conditions students participated in six sessions (one per week), in which they were asked to watch a two-minute video on different relevant notions of natural selection, after which they had to answer questions related to problematic situations involving natural selection (the same for each condition). Students were measured based on their knowledge of natural selection pre- and post-sessions (post-immediate and post-delayed) using a test initially developed by Asterhan and Dotan (2017) and adapted and validated for this study. The sessions were videotaped. We conducted ANOVA repeated measures to evaluate the differences across conditions.

Belief in a just world and justice experiences of cyber-victimized students

Keywords: At-risk students, Educational Psychology, Social aspects of learning and teaching, Social interaction

Presenting Author: Matthias Donat, Martin Luther University Halle-Wittenberg, Germany; **Co-Author:** Claudia Rüprich, MLU Halle-Wittenberg, Germany; **Co-Author:** Christoph Gallschütz, MLU Halle-Wittenberg, Germany

Recent studies showed that students who strongly endorsed the personal belief in a just world (BJW) were less likely to report that they were victimized by other students. Furthermore, researchers emphasized that students who were bullied offline are likely to be bullied online as well when using electronic devices such as smart phones or social communication platforms online. Thus, we expected a strong personal BJW to be negatively related to the frequency of online (cyber) victimization in students. We further investigated the extent to which this relation would be mediated by experiences of classmate justice and whether the expected relations would persist when we controlled for student gender, internet use, and social desirability. We tested our hypotheses in a cross-sectional questionnaire study with N = 1,045 German school students aged between 13 and 18 years (M = 14.1, SD = 0.6; 48.2% females). Regression analyses resulted in personal BJW that significantly explained variance in self-reported cyber-victimization, partly mediated by classmate justice. The more strongly the students endorsed the personal BJW and the more they felt justly treated by their classmates, the less likely they were to report being cyber-victimized by others. These analyses resulted also in significant relations when controlled for confounding effects of gender, internet use, and social desirability. We will discuss the adaptive functions of BJW and implications for future school research and practice.

Adolescents' bullying, risk behavior and problems: Do social factors matter in three countries?

Keywords: At-risk students, Educational Psychology, Social aspects of learning and teaching, Social interaction

Presenting Author: Anett Wolgast, Martin-Luther-Universität Halle-Wittenberg, Germany; **Presenting Author:** Matthias Donat, Martin Luther University Halle-Wittenberg, Germany

Previous research indicated adolescents' bullying or victimization experiences to be related to risk behavior (e.g., smoking) and internalizing problems (e.g., feeling low). A research review suggested adolescents' antisocial behavior to be related to behavior problems and social processes. Accordingly, we expected perpetrator experiences or victimization experiences to be related to risk behavior, internalizing problems and social processes such as talking to friends or perceived peer support. In a cross-cultural trend study, we aimed to replicate and extend recent findings by analyzing data from three countries at three measurement times (T1–T3) across eight years of World-Health-Organization surveys. The samples consisted of n = 3,458 adolescents from the U.S., Germany, and Greece at T1, n = 3,441 adolescents at T2, and n = 4,021 adolescents (about 16 years of age) at T3. We analyzed the data from each country by structural equation modeling including bullying vs. victimization experiences, risk behavior, internalizing problems, talking to friends, perceived peer support, and further relevant variables (e.g., school pressure, socioeconomic status, sex). Bullying or victimization experiences were positively related to risk behavior and internalizing problems across culture and time. Perpetrator or victimization experiences were not or even negatively associated with talking to friends and perceived peer support. The results provide approaches for dealing with stressors and further bullying prevention programs.

Session Q 10

15 August 2019 17:15 - 18:45

Seminar Room - S05

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Writing, Literacy and Language

Keywords: Attitudes and beliefs, Developmental processes, Language (L1/Standard Language), Qualitative methods, Social interaction, Teacher professional development, Teaching approaches, Teaching/instruction, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Marjolein Dobber, Vrije Universiteit Amsterdam, Netherlands

Grammatical Reasoning: students' metatalk about grammar for writing

Keywords: Language (L1/Standard Language), Qualitative methods, Teaching/instruction, Writing/Literacy

Presenting Author:Annabel Watson, University of Exeter, United Kingdom; **Co-Author:**Ruth Newman, University of Exeter, United Kingdom

This paper examines how students aged 10-11 are able to articulate metalinguistic thinking about writing. It is situated within the context of a large-scale randomised control trial (RCT), funded by the Education Endowment Fund in England, in which young writers were taught to analyse and discuss the grammatical choices made by writers and to experiment with the impact, effect and meaning of these choices in their own writing. Presented here is an analysis of observation data and student writing samples from an accompanying qualitative strand within the RCT, in which 17 classes were observed during the intervention. The research questions explore how students explain grammatical features and link these features to effect; how classroom dialogue enables or inhibits students' ability to articulate metalinguistic understanding; what students' talk reveals about their understanding of grammar. The results provide insights into how students are able to use talk to reason about grammar, developing their understanding through peer and teacher-led conversations which see them puzzling out grammatical constructions and debating their effects. It is significant in developing our theoretical understanding of the role that classroom dialogue plays in developing metalinguistic understanding, and specifically in providing insights into the types of dialogue which support emergent articulation of metalinguistic understanding through creating opportunities for 'grammatical reasoning'.

Making metalinguistic choices: different ways of 'knowing'

Keywords: Language (L1/Standard Language), Social interaction, Teaching approaches, Writing/Literacy

Presenting Author:Susan Jones, University of Exeter, United Kingdom; **Co-Author:**Debra Myhill, University of Exeter, United Kingdom; **Co-Author:**Helen Lines, University of Exeter, United Kingdom

Drawing on case study data with twenty-four young writers involved in a three-year longitudinal study, this paper considers evidence for how meta-linguistic understanding informs deliberate writing choices. The data reports the changing pattern of conscious and unconscious choices being made by these young writers, showing how curriculum emphasis has tended to prioritise grammatical use over rhetorical purpose, thus raising grammatical use to conscious awareness. The data also shows how linguistic understanding appears first in text before being articulated as a conscious choice, suggesting that implicit and procedural linguistic understanding is not dependent on explicit and declarative understanding. However, by exploring the evidence of development which is afforded by a longitudinal study, the paper will show how multiple types of language awareness inform each other in developing increased sophistication in the making of deliberate writing choices. The paper aims to contribute to a theoretical understanding of the role of conscious and unconscious choices in developing meta-linguistic understanding

How and how well do Dutch secondary students write? A national baseline study on synthesis writing

Keywords: Attitudes and beliefs, Developmental processes, Language (L1/Standard Language), Writing/Literacy

Presenting Author:Nina Vandermeulen, University of Antwerp, Belgium; **Co-Author:**Elke Van Steendam, KU Leuven, Belgium; **Co-Author:**Gert Rijlaarsdam, University of Amsterdam, Netherlands; **Co-Author:**Sven De Maeyer, University of Antwerp, Belgium; **Co-Author:**Marije Lesterhuis, University of Antwerp, Belgium

Background: Our study focuses on synthesis writing. In synthesis writing, a writer constructs a new text based on information derived from multiple sources. It is a complex and frequently required task in higher education. **Aim:** We carried out a national baseline study to provide us with an insight into the writing skills, writing processes and attitudes of Dutch students (L1), and to identify patterns of growth over the grades. **Method:** More than 700 students (grade 10 – 12) participated. All participants wrote four syntheses. Text quality was rated holistically by 48 raters, using a rating scale with benchmark texts. The writing processes were registered with keystroke logging software Inputlog. Participants also completed a questionnaire measuring their writing style preference (degree of planning and revision). **Results:** We found significant differences in text quality, processes and writing style between the grades. The higher grade students performed significantly better (ES= .44 for difference between grade 10 and 11, ES= .34 for difference between grade 11 and 12). Throughout the writing process, higher grade students balanced their reading and writing time more, wrote more fluently and revised more. They also had a clearer defined writing style preference. **Relevance:** This baseline study provides information on text quality, writing processes and writing style of a large sample. It gives insight into the development of these three aspects over the grades. In current and future projects it allows to establish the process-product link, and to develop instruction and feedback on synthesis writing for education.

Examining Grammar as Choice: An RCT Writing Intervention

Keywords: Language (L1/Standard Language), Teacher professional development, Teaching approaches, Writing/Literacy

Presenting Author:Debra Myhill, University of Exeter, United Kingdom; **Co-Author:**Susan Jones, University of Exeter, United Kingdom; **Co-Author:**Helen Lines, University of Exeter, United Kingdom

The aims of this study were twofold: to evaluate at scale the efficacy of an intervention to improve student outcomes in writing, and to understand the constraints and barriers which impede successful implementation of the intervention. The rationale underpinning the pedagogical approach of the intervention drew on Halliday's functional theorisation of grammar and his view of grammar as a resource for meaning-making. The writing intervention sought to develop students' metalinguistic understanding of the relationship between grammatical choices and meaning-making effect in writing. The study was a randomized controlled trial, involving 155 schools and 7,239 children aged 10-11, in their final year of primary education in England. The statistical analysis showed no effect of the intervention on student writing outcomes. However, the fidelity measures indicated that teachers did not consistently implement the pedagogical approach as the training had suggested in two significant ways – they did not always manage metalinguistic discussion of choices, with a tendency to be directive about choices; and they deviated from the pedagogy to teach grammar in isolation in preparation for the national grammar test taken by this age group. The study is significant in highlighting the challenges of changing pedagogical practice, particularly when it may seem to be counter to the requirements of a high-stakes national test. It also illustrates some of the limitations of large-scale RCTs when conducted in classroom contexts where the goal of scalability makes it very difficult to achieve consistency and fidelity in intervention implementation.

Session Q 11

15 August 2019 17:15 - 18:45

Seminar Room - S01

Single Paper

Higher Education, Motivational, Social and Affective Processes

Higher Education

Keywords: Case studies, Collaborative Learning, Competencies, Computer-assisted learning, Emotion and affect, Engineering, Higher education, Interdisciplinary, Peer interaction, Problem solving, Student learning, Survey Research

Interest group: SIG 04 - Higher Education

Chairperson: Orit Ben Zvi-Assaraf, Ben-Gurion University of the Negev, Israel

Design Principles for Wicked Problem Solving: Dealing with Complexity, Uncertainty and Divergence

Keywords: Case studies, Collaborative Learning, Higher education, Problem solving

Presenting Author: Marieke Veltman, Windesheim University of Applied Sciences, Netherlands; **Co-Author:** Hanno Van Keulen, Windesheim Flevoland University of Applied Science, Netherlands; **Co-Author:** Joke Voogt, Windesheim University of Applied Sciences, Netherlands

Higher educated professionals are expected to take the lead in solving challenging, complex tasks and problems with a high degree of dynamics, cross-disciplinary collaboration and boundary crossing activities. A successful preparation of students in Higher Professional Education (HPE) to participate in wicked problem solving requires a better understanding of the nature of these problems, the required skills, and of how their acquirement can be enhanced. This study applied an in-depth qualitative multiple case study design of six good practices in HPE. Data were derived from literature, document-study, semi-structured interviews with participants, and observations. The purpose of the study was to explore how relevant stakeholders perceive the position and importance of wicked problems in curriculum components. In addition, it focussed on characteristics related to the wickedness of the problems in the interventions designed by the design teams, such as teacher roles and stakeholder collaboration. Building on the three-dimension model of wickedness by Head (2008) and on the four dialogical learning mechanisms of boundary crossing of Akkerman and Bakker as sensitizing concepts (2011), this study aimed to generate methodological directions for the design of practices that result in wicked problem solving expertise. More specifically, the research question was: What are the characteristics of the problems central in HPE modules that prepare students to cross boundaries in the open-ended process of solving wicked problems? The study revealed conjectures for design principles for the design of practices that result in wicked problem solving expertise concerning the nature of problems and the problem environment.

Building a boundary crossing Master course through an intervention-based approach

Keywords: Competencies, Higher education, Interdisciplinary, Student learning

Presenting Author: Carla Oonk, Wageningen University, Netherlands; **Co-Author:** Perry den Brok, Wageningen University, Netherlands; **Co-Author:** Judith Gulikers, Wageningen University, Netherlands

Abstract Higher education life sciences students work on complex societal problems that require collaboration across the boundaries of disciplines, cultures and the practices of academia and society. For this to enable, students need to develop boundary crossing competence, i.e. the ability to work and learn with and from 'the other'. This study both exploits and explores boundary crossing competence development in a Master course by co-designing in a design-team of teachers increasingly intensive student support trajectories on boundary crossing over a series of three consecutive cohorts. Students' levels of boundary crossing competence were measured by using a pre- and post-test boundary crossing rubric and students' scores on their final reflection papers on boundary crossing activities and perceived capabilities. Preliminary results show a higher level of student boundary crossing competence and less difference between self-perceived and actual competence scores in the second cohort compared to the first cohort. This suggests that the designed support is beneficial. The study contributes to the small body of literature on using the boundary crossing theory for developing boundary crossing learning activities and the measurement thereof. The studies' co-creative intervention-design show-cases educational staff how to implement evidence-informed student support of competence development into an existing course.

Unveiling the Predictors of Academic Belonging in Higher Education

Keywords: Emotion and affect, Higher education, Peer interaction, Survey Research

Presenting Author: Yesim Capa Aydin, Middle East Technical University, Turkey; **Co-Author:** Sercan Erer, Middle East Technical University, Turkey

Utilizing a survey research method, this study aimed to examine academic belonging of university students and factors predicting it. With such an aim, the research questions have unveiled the departments with the highest and lowest scores in academic belonging and how well individual variables predicted academic belonging of university students. With 359 participants, the results revealed that while the highest score belongs to the city and regional planning department, the lowest is from food engineering. Moreover, the development of a sense of academic belonging towards departments at the bachelor's level is significantly predicted by cumulative grade point average of university students.

Improving individual learning processes in civil engineering by the use of a digital support concept

Keywords: Computer-assisted learning, Engineering, Higher education, Student learning

Presenting Author: Marcel Pelz, University of Duisburg-Essen, Germany; **Co-Author:** Martin Lang, University of Duisburg-Essen, Germany; **Co-Author:** Yasemin Özmen, University of Duisburg-Essen, Germany; **Co-Author:** Jörg Schröder, University of Duisburg-Essen, Germany; **Co-Author:** Felix Walker, Technical University of Kaiserslautern, Germany; **Co-Author:** Ralf Müller, Technical University Kaiserslautern, Germany

For many years high dropout rates are very common, especially in engineering studies. When considering the field of civil engineering, it can be observed that even one in two undergraduates leave university prematurely without a degree. One reason for this can be a lack of academic success in the first semesters, which can be considered as a consequence of performance problems in the basic subjects of civil engineering studies (e.g. engineering mathematics and engineering mechanics). In order to face this problem, a digital support concept was developed in the context of the collaborative research project FUNDAMENT (Improvement of individual learning success by the use of digital media in civil engineering) – University of Duisburg-Essen and Technical University of Kaiserslautern. This concept includes preventive support offers that are used in the preliminary phase as well as in the introductory phase. A focused view of the preliminary study phase is presented, which includes online self-assessments with adaptive feedback and a corresponding online prep course. In contrast to other offers, besides the subject area of mathematics, the topic complex of engineering mechanics is treated as well. Furthermore, broader determinants will be reviewed, which amongst others provide an insight in terms of the students vocational interest and the aspired study program. Following on the presentation at the Earli SIG 04 Conference, first results of the main study regarding the use and effectiveness of the online self-assessment and the online prep course in the preliminary phase are presented and discussed in the plenum.

Session Q 12

15 August 2019 17:15 - 18:45

Seminar Room - S12

Single Paper

Learning and Instructional Technology

Educational Technology and Game-based Learning

Keywords: Computer-assisted learning, Educational Psychology, Educational technology, Game-based learning, Learning Technologies, Multimedia learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Kati Mäkitalo, University of Oulu, Finland

Conceptualizing Augmented Reality from a Psychological Perspective

Keywords: Computer-assisted learning, Educational Psychology, Educational technology, Learning Technologies

Presenting Author: Jule Krüger, Universität Duisburg-Essen, Germany; **Co-Author:** Daniel Bodemer, University of Duisburg-Essen, Germany

In this presentation, an attempt is made to conceptualize augmented reality (AR) from a psychological perspective. Three frequently cited characteristics of AR are reframed from a psychological point of view and linked to educational research. Also, an important educational research area is identified for each characteristic. The first characteristic, contextuality, describes AR's potential to show both real world and virtual elements at the same time, making it possible to connect them with each other. It is suggested that the interaction between the context and the virtual elements, and its potential to support learning should be researched further. The second characteristic, interactivity, emphasizes the potential AR has for combining the intuitive interaction of real elements with the

interactive possibilities of virtual elements. The possibilities of AR to motivate intuitive and active interaction with educational material are proposed as a research area. The third characteristic, spatiality, refers to AR's way of placing virtual objects inside the real world that gives them spatial depth. Here, research to identify how AR visualizations can be used to convey spatial knowledge better than real objects can is suggested. It is concluded that future research on using AR in educational settings can be guided by the research areas discussed in this presentation.

Gamifying a Simulation: Analyzing Game Goal, Choice, Points, and Praise

Keywords: Computer-assisted learning, Educational technology, Game-based learning, Learning Technologies

Presenting Author:Tereza Hannemann, Charles University, Czech Republic; **Co-Author:**Tereza Starkova, Charles University, Czech Republic; **Co-Author:**Edita Bromová, Charles University Prague, Czech Republic; **Co-Author:**Filip Děchtěrenko, The Czech Academy of Sciences, Czech Republic; **Co-Author:**Cyril Brom, Charles University, Czech Republic

Despite the increased interest in gamification approaches, little is known about the applicability of these approaches in educational contexts. This hinders the application of certain gamification elements as adaptive elements within educational material. To shed more light on this, an experiment with university learners ($N = 98$) was conducted. They studied a complex process (i.e., how to brew beer) in a two-hour-long computerized simulation. In the experimental (i.e., gamified) condition, the simulation featured the following game design elements: game goals, increased freedom of choice, points, virtual currency, and praise. These elements were absent in the simulation versions used in the two control conditions. The participants were randomly assigned to one of these three conditions. Learning outcomes (retention and transfer, immediate and one-month delayed), perceived difficulty, and intrinsic motivation factors (triggered situation interest, flow, positive affect, learning involvement, and enjoyment) were examined. No difference in learning outcomes and intrinsic motivation variables between the gamified simulation and its non-gamified counterparts were found. However, the gamified simulation was perceived to be significantly easier than the non-gamified versions. The findings support the emerging notion that specific gamification elements need substantially more research before they are used within an adaptive scenario. Additionally, this experiment highlights the potential of learning analytics to identify which gamification elements might work, and which doesn't.

Adaptive Opponents Within Educational Video Games: Manipulating Facial Expressions and Difficulty

Keywords: Computer-assisted learning, Educational technology, Game-based learning, Learning Technologies

Presenting Author:Steve Nebel, Chemnitz University of Technology, Germany; **Co-Author:**Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany

Adaptive mechanisms within game-based-learning need boundary conditions and game states that have been validated as particularly beneficial regarding the learning processes and outcomes. However, up to this point, there is a crucial need for additional controlled experimental research providing such insights. Therefore, the presented experiment focus on two factors within a competitive quiz game. More specifically, the components facial expressions of the opponent and adaptive game difficulty were investigated. Results demonstrate that the game difficulty does influence player behavior and performance significantly. Additionally, it was assumed that these two factors are intertwined regarding their influences on motivation. This assumption could be confirmed, as the interaction effect between difficulty and opponent appearance was found to be significant. These results are supplemented by further analyses of self-efficacy and challenge, revealing deeper insights into the underlying processes. Thus, the study does not only add important evidence for the improvement of adaptive game elements, but also provides game-mechanic recommendations that could be useful for the creation of similar quiz-based educational video games.

Effects of Domain-Specific Prior Knowledge on Complex Skill Acquisition in a Simulation Game

Keywords: Computer-assisted learning, Educational technology, Game-based learning, Multimedia learning

Presenting Author:Joy Yeonjoo Lee, Maastricht University, Netherlands; **Co-Author:**Jeroen Donkers, Maastricht University, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands

Computerized simulation games provide effective learning environments for complex skills such as resuscitation. However, it is yet unknown how the domain-specific prior knowledge of learners affects the process of skill acquisition in a simulation game environment. We assume that in general complex skills improve in four aspects: (1) systematicity in skill performance (indicator of acquired strategies), (2) accuracy in visual selection and motor reactions (indicator of formed cognitive rules), (3) speed in performance (indicator of the strength of those rules), and (4) reduced mental effort. The following research question is addressed: does the level of domain-specific prior knowledge influence the level of complex skills demonstrated in a simulation game environment? This study used a medical simulation game for training resuscitation skills. Participants were 20 residents and medical doctors (experts with high domain-specific prior knowledge) and 20 medical students (novices with low domain-specific prior knowledge). Following a pre-training session, they conducted a full simulation scenario, during which game-logs and eye-movements were collected. A cognitive load questionnaire was conducted afterward. Results showed that experts demonstrated more systematicity in their performance than novices. Experts also showed higher visual selectivity and accurate reactivity. They performed unit-tasks at a higher speed, and reported lower levels of cognitive load. These results indicate that domain-specific prior knowledge can have a significant impact on the level of complex skills in simulation game environments.

Session Q 13

15 August 2019 17:15 - 18:45

Seminar Room - S10

Single Paper

Learning and Special Education, Teaching and Teacher Education

Mathematics

Keywords: Achievement, At-risk students, Learning disabilities, Learning Technologies, Mathematics, Model-based reasoning, Special education, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 15 - Special Educational Needs

Chairperson: Francesca Suter, University of Zurich, Switzerland

Making the Psychological Dimension of Learning Mathematics Visible

Keywords: Achievement, Learning Technologies, Mathematics, Model-based reasoning

Presenting Author:Gyongyver Molnar, University of Szeged, Hungary; **Presenting Author:**Moritz Herzog, University of Duisburg-Essen, Germany; **Co-Author:**Benő Csapó, University of Szeged, Hungary

Technology-based assessment offers new possibilities in the field of mathematics learning. It can support everyday educational processes by collecting data on students' cognitive development and providing teachers feedback to improve mathematics teaching. The aim of this study is to show how the psychological dimension of learning mathematics can be assessed and how effectively it can be predicted based on students' level of mathematics school knowledge. The sample for the study was drawn from fourth- to sixth-grade students (aged 9–12) in Hungarian primary schools. There were 4993 students in the sample. The instruments were online tests consisting of 101 items from the eDia item bank. Results confirmed that the disciplinary, application and psychological dimensions of learning mathematics can be empirically distinguished. Path models suggested that the psychological dimension of learning mathematics plays an important role by predicting mathematics knowledge as a set of latent constructs. The predictive power was almost the same as students' level of disciplinary knowledge or the level of its application. Generally, girls proved to be more developed in the psychological dimension of mathematics. This study (1) provides evidence that the psychological dimension of mathematics learning can be made visible even in an educational context. It (2) highlights the importance of explicit development of the psychological dimension of mathematics in school lessons as it strongly predicts our general knowledge in the field of mathematics. Finally, it (3) demonstrates that there are gender differences in the developmental level of the psychological dimension of mathematics in favour of girls.

The development of arithmetic concepts up to 100

Keywords: At-risk students, Mathematics, Model-based reasoning, Teaching/instruction

Presenting Author:Antje Ehler, University of Potsdam / University of Johannesburg, Germany; **Co-Author:**Annemarie Fritz-Stratmann, University of Duisburg-Essen, Germany

Relatively reliable statements can be made regarding the arithmetical concepts children develop in preschool and first grade age. To explain this development, Fritz et al. (2013; 2018) provided a theoretically based and empirically validated hierarchical sequence covering the number range up to 20. Still relatively unknown is how these arithmetic concepts are developed in the bigger number range up to 100. For this reason investigated whether arithmetic concepts develop in the extended number range according to the theory by Fritz et al. (2013; 2018) and how the individual conceptual development of complex number ranges is connected. 178 children were tested at the beginning of grade 2, respectively at the beginning of grade 3 with the MARKO-D1 (Fritz, Ehler, Ricken & Balzer, 2017). Additionally, they solved tasks within the larger number range derived from the MARKO-D1-Test. The number range was systematically extended: between 40 and 50 and between 70 and 80. The IRT based results show that items are mainly arranged hierarchically in accordance to the main theoretical assumption. Assuming a successive acquisition of arithmetical concepts even in the respective number range extensions, results show that depending on the number range extension the tasks of equal concepts vary in difficulty: the higher the number, the more difficult are the tasks of the same concept. Interpreting the content of the results it means that the concepts are acquired in a small number range first and are shifted in the extended number range later.

Testing the Efficacy of a Number Sense Intervention for At-Risk Kindergarten Students

Keywords: At-risk students, Learning disabilities, Mathematics, Special education

Presenting Author:Ben Clarke, University of Oregon, United States; **Co-Author:**Christian Doabler, University of Texas at Austin, United States

Kindergarten represents a critical tipping point in students' mathematical development, particularly for students at risk for mathematics learning disabilities (MLD). This presentation shares results from a recent randomized controlled trial involving 252 U.S. kindergarten students at risk for MLD. The study examined the treatment effects of a supplemental, kindergarten Tier 2 mathematics intervention aimed at building early number sense skills. Results from the study revealed overall treatment effects and no differential impact based on the size of the instructional group in which the intervention was delivered. Specifically, analyses revealed a significant impact on standardized measures of mathematics achievement, with effect sizes (Hedges' *g*) ranging from 0.58 to 0.75). Implications for extending the literature on effectively teaching at-risk kindergarten students will be discussed.

The opportunity propensity model predicting mathematical accuracy and speed.

Keywords: At-risk students, Learning disabilities, Mathematics, Model-based reasoning

Presenting Author:Annemie Desoete, Ghent University / Artevelde University College, Belgium; **Co-Author:**Elke Baten, University of Ghent, Belgium

This study investigated individual differences in antecedent-, opportunity- and propensity indicators for math learning in a group of school-aged children with clinical Mathematical Learning Disabilities (MLD) and an age and context matched control group. Participants were 114 elementary school children in Belgium. Results indicated the importance of teacher training programs. In addition children with and without MLD differed on propensity indicators, meaning that their capacity and willingness to take advantage of given opportunities might not be the same. Differences in motivation, temperament and personality were reported. Further, results revealed lower levels of self-esteem, subjective well-being and self-perceived competence in the older children with MLD compared to controls. This might indicate the tremendous impact of continuously struggling with mathematics when getting older. Next, for antecedent factors, this study revealed the importance of parental aspirations towards mathematics. Finally, in line with the componential structure of mathematics, what we found was dependent on the math task that was studied (fact retrieval speed vs. procedural accuracy). Implications for our understanding of the processes underlying mathematics achievement and the implementation towards practice will be discussed.

Session Q 14

15 August 2019 17:15 - 18:45

Seminar Room - S02

Single Paper

Learning and Instructional Technology

Educational Technology and Instructional Design

Keywords: Computer-assisted learning, Educational technology, Instructional design, Learning Technologies, Multimedia learning, Science education, Workplace learning

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Antonia Zachariou, University of Roehampton, United Kingdom

Researching mental model growth of complex skills in formative assessment via Video-enhanced rubrics

Keywords: Computer-assisted learning, Educational technology, Learning Technologies, Multimedia learning

Presenting Author:Kevin Ackermans, Open University, Netherlands; **Co-Author:**Ellen Rusman, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Rob Nadolski, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Saskia Brand-Gruwel, Open University of the Netherlands, Netherlands; **Co-Author:**Marcus Specht, Welten Institute - Open University of the Netherlands, Netherlands

Learners can experience difficulties to imagine how to master a complex skill using solely a text-based analytic rubric (TR). TR's deficiencies for skill-mastery might be supported by adding video-modelling examples with embedded self-explanation prompts, turning TR into a new type of rubric format we called 'video-enhanced analytic rubrics' (VER). The current study contrasted three conditions for fostering growth of learners' mental model of complex skills, using the VER version of the formative assessment (FA) supporting *Anonomized*-app (n=49), the TR version of the FA supporting *Anonomized*-app (n=54) or no rubrics (control condition (n=50)). The study was a three-group (VER, TR, control) within-subjects design (T1= 0 weeks, T2= 12weeks, T3= 24weeks). Learners' mental models for three complex skills were measured through their constructed open concept maps (before project one (T1), after project one (T2), and after project two (T3)). We expected the *Anonomized*-app to foster learners' mental models growth in the conditions, with the VER condition in particular. A mixed between-within subjects ANOVA showed that all learners developed richer mental models via the *Anonomized*-app (main effect). In addition learners receiving VER developed richer mental models for all three skills, when compared to both other groups. Finally, learners receiving TR developed richer mental models for all three skills than the control group.

The effect of augmented reality instructions as cognitive support during assembly tasks

Keywords: Computer-assisted learning, Educational technology, Instructional design, Workplace learning

Presenting Author:Pieter Vanneste, KU Leuven, Belgium; **Co-Author:**Yi Huang, Faculty of Psychology and Educational Sciences, KU Leuven, Dekenstraat 2, 3000 Leuven, Belgium, China; **Co-Author:**Ellie Park, imec-ITEC, KU Leuven campus Kulak Kortrijk, Etienne Sabbelaan 51, 8500 Kortrijk, Belgium ; Faculty of Psychology and Educational Sciences, KU Leuven, Dekenstraat 2, 3000 Leuven, Belgium, Belgium; **Co-Author:**Annelies Raes, KU Leuven, Belgium; **Co-Author:**Fien Depaepe, KU Leuven, Belgium; **Co-Author:**Wim Van den Noortgate, imec-ITEC, KU Leuven campus Kulak Kortrijk, Etienne Sabbelaan 51, 8500 Kortrijk, Belgium ; Faculty of Psychology and Educational Sciences, KU Leuven, Dekenstraat 2, 3000 Leuven, Belgium, Belgium

This study compares the effects of oral, paper and Augmented Reality (AR) instructions on the productivity (total assembly time), the quality (the amount of errors), the operators' well-being (stress) and the operators' independence (the frequency of help-seeking behaviour) during assembly tasks. Furthermore, this study examines the effects of characteristics of the operator (i.e. cognitive skills, work execution skills and experience) on the same outcome variables. In a within-subjects experiment, 44 participants performed three different assembly tasks, alternating the instructional medium. The majority of the operators had cognitive disabilities. Multilevel analysis showed that AR instructions did not significantly improve the productivity nor increase operators' independence. However, AR instructions did contribute to a better quality and reduced operators' stress. Furthermore, better cognitive skills and more experience were found to

be beneficial towards productivity, quality and stress. In the context of Industry 4.0, where products become more complex and the product portfolio becomes more diversified, it will be a challenge to help operators to deal with that increased complexity, while maintaining a good balance between productivity, quality and well-being.

Effects of Augmented Reality Apps in the Early Astronomy Classroom

Keywords: Computer-assisted learning, Educational technology, Instructional design, Science education

Presenting Author:Andreas Lachner, University of Tübingen, Germany; **Co-Author:**Elisabeth Wegner, University of Freiburg, Germany; **Co-Author:**Gjylizare Haziri, University of Freiburg, Germany; **Co-Author:**Caroline Harms, University of Freiburg, Germany; **Co-Author:**Anna Zörlein, University of Freiburg, Germany

Augmented reality (AR) apps are regarded to scaffold students' conceptual learning. The benefits for younger students and the underlying mechanisms, however, are largely unexplored. In three empirical studies, we investigated the potential of AR environments in primary astronomy education. In Study 1, we found that AR environments triggered distinct knowledge-building activities, as students provided a significant proportion of self-explanations during interacting with the AR-environment. In Study 2, students with the AR-environment gained more knowledge than students who accomplished a tablet-based online quiz (i.e., retrieval-practice). To examine additional effects of sensory-motor experiences, in Study 3, we compared the AR-environment to a 2-D-tablet-based environment which did not provoke body movements. Students in the AR-environment and students in the control condition had comparable learning gains. Thus, we can conclude that rather the triggered knowledge building activities than the additional sensory-motor experiences within the AR environment accounted for students' learning.

When Instructional Media Matters: Benefits of Safety Training in Virtual Reality

Keywords: Computer-assisted learning, Educational technology, Instructional design, Learning Technologies

Presenting Author:Guido Makransky, University of Copenhagen, Denmark; **Co-Author:**Stefan Borre-Gude, University of Aarhus, Denmark; **Co-Author:**Richard E. Mayer, University of California Santa Barbara, United States

The main objective of this study was to examine the instructional and motivational value of using different instructional media—in this case an immersive virtual reality (VR) simulation, a desktop VR simulation, and a conventional safety manual—to deliver a university laboratory safety training course. A sample of 105 first year undergraduate engineering students (49 males and 56 females) participated in an experimental design wherein students were randomly assigned to one of the three training conditions. Results indicated that the groups did not differ on the immediate retention test; however significant differences were observed favoring the VR groups on the two delayed transfer tests involving using the learned material to solve problems in a physical lab 10 days after the training intervention. The motivational value of the VR training was also higher as indicated by significantly higher enjoyment scores and positive pre- to post-test changes in intrinsic motivation, compared to a negative pre- to post-test change for the safety manual group. A significant positive pre- to post-test change in self-efficacy was also observed for the immersive VR group. The results suggest that measures of delayed transfer in realistic settings may be necessary to accurately assess the instructional value of VR learning environments.

Session Q 15

15 August 2019 17:15 - 18:45

Seminar Room - S14

Single Paper

Learning and Social Interaction, Motivational, Social and Affective Processes, Teaching and Teacher Education

Teacher Effectiveness

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Cultural diversity in school, Educational Psychology, Motivation, Pre-service teacher education, Primary education, Psychometrics, Quantitative methods, Student learning, Teacher Effectiveness

Interest group: SIG 08 - Motivation and Emotion, SIG 11 - Teaching and Teacher Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Viivi Virtanen, University of Helsinki, Finland

Stability and changes in students' motivational profiles: The role of teaching quality and feedback

Keywords: Motivation, Quantitative methods, Student learning, Teacher Effectiveness

Presenting Author:Katharina Dreiling, University of Göttingen, Germany; **Co-Author:**Ariane S. Willems, Institute for Educational Science, University of Göttingen, Germany

Individual student characteristics are important for the effectiveness of learning processes. Accordingly, empirical research shows that students' motivational and cognitive learning characteristics influence their perception of their learning environment (Seidel, 2006). By applying person-centered approaches, recent studies illustrate that the students' individual perceptions of supportive learning conditions, as for example teacher feedback and teacher need-support, differ across students' individual motivational profiles (Corpus&Wormington, 2014; Dreiling&Willems, 2018). As longitudinal studies are still rare, it is unclear how motivational profiles change over time and, particularly, whether changes in motivational profiles are influenced by students' perception of the teaching quality. The present study aims at (i) describing changes of students' motivational profiles across a school semester and (ii) analyzing the role of perceived teaching quality in predicting changes in profile membership over time. In a longitudinal study, we investigated n=810 senior high school students from German language classes. We developed a standardized questionnaire to assess different dimensions of teaching quality and different forms of students' intrinsic and extrinsic learning motivation. By using Latent Profile Analyses, three motivational profiles were identified: (i) students with high levels of intrinsic and extrinsic forms of motivation, (ii) students with low levels of intrinsic but high levels of extrinsic forms of motivation, and (iii) students with moderate levels of both intrinsic and extrinsic forms of motivation. Longitudinal analyses showed that while the motivational profiles of 75% of the students remain stable over time, the observed changes in motivational profiles are systematically predicted by the teaching quality.

Student characteristics and teacher expectations: A timely perspective

Keywords: Attitudes and beliefs, Educational Psychology, Primary education, Teacher Effectiveness

Presenting Author:Christine Rubie-Davies, University of Auckland, New Zealand; **Co-Author:**Mohamed Alansari, University of Auckland, New Zealand; **Co-Author:**Penelope Watson, University of Auckland, New Zealand; **Co-Author:**Annaline Flint, University of Auckland, New Zealand; **Co-Author:**Lyn McDonald, University of Auckland, New Zealand

Many studies have examined student characteristics as potentially influencing teachers' expectations but the findings have been equivocal. These inconsistencies could be due to different teachers being included in various studies. The current study explored associations between student characteristics (SES, ethnicity, gender, age) and teacher expectations in reading and mathematics for the same students but different teachers, over three years. Elementary school teachers (91 in the first year, 122 the second and 146 the third) provided expectations in reading and mathematics for 1789 students tracked for three years. In both reading and mathematics, the relations between expectations and student characteristics varied when teachers differed each year. For example, whereas ethnicity only predicted teachers' expectations in the study's third year in reading, gender predicted expectations in the first year. The findings suggested that some teachers gave more weight to student characteristics in forming their expectations than did other teachers, given that students did not vary. The finding has both practical and theoretical implications. Teachers need to be made aware of the importance of accurate expectations for student learning opportunities. Professional development may ameliorate some of the inaccuracy. From a theoretical perspective, the study shows that longitudinal studies (of which there are very few) are needed in the field in order to disentangle student versus teacher effects in the formation of expectations.

Teaching and learning in diverse schools: Attitudes, beliefs and practices

Keywords: Achievement, Attitudes and beliefs, Cultural diversity in school, Teacher Effectiveness

Presenting Author:Denisse Gelber, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Lorena Ortega, CIAE, Universidad de Chile, Chile; **Co-Author:**Alonso González, Center for Educational Justice, Chile; **Co-Author:**Ernesto Trevino, Pontificia Universidad Católica de Chile, Chile; **Co-Author:**Lucia

Monteiro, Universidad de la República / ANII, Uruguay; **Co-Author:**Denise Courtoisie, Ministerio de Educacion, Uruguay

This study presents empirical evidence regarding one of the main challenges of the educational reform process in Chile in its attempt to develop a fairer, more equal and inclusive educational system. Based on a sample of 51 public schools from 5 communities in Santiago (Chile), with large proportions of immigrant and indigenous students, we collected surveys from principals, 7th grade math teachers (N=55) and 7th grade students (N=1800), and we also applied a standardized math test to every participant student. This paper sheds light on principals and teachers' positive attitudes and beliefs regarding diversity and inclusion, as well as how far their practices are from promoting inclusion and equal achievement opportunities among their students. A clear implication from this study is the need to offer guidelines and training for teachers and principals to promote inclusion in their classrooms and schools.

Development of a Construct-Informed Test to Screen Prospective Teachers

Keywords: Assessment methods and tools, Pre-service teacher education, Psychometrics, Teacher Effectiveness

Presenting Author:Robert Klassen, University of York, United Kingdom; **Co-Author:**Lisa Kim, University of York, United Kingdom

We report three phases of development and administration of a construct-informed situational judgment test (SJT) designed to screen applicants to a large and selective initial teacher education (ITE) program in the UK. In this ITE program, applicants undergo initial screening online and, if successful, attend an intensive assessment center (AC) for selection. In Phase 1 the construct-informed development of the target attributes and test content is described. Phase 2 reports brief results from the online administration of a prototype SJT to 3341 applicants (64.1% female). Phase 3 reports results from the online administration of a revised SJT to 587 applicants (61.7% female). We examine the relationship of the revised SJT with other screening tests and with AC activities (personal interview, teaching demonstration, and group activity). Results show that the revised SJT was internally reliable and significantly related to other screening tests and AC activities. High scorers on the SJT scored significantly higher at the AC. The SJT was a stronger predictor of two of three AC activities (not the group activity) than the other screening tests. The factor structure of the test was unidimensional and did not clearly reflect the six target attributes which underpinned the development of test content. Further development of SJTs for screening applicants for ITE programs are considered.

Session Q 16

15 August 2019 17:15 - 18:45

Seminar Room - S06

Single Paper

Learning and Social Interaction

Social Aspects of Learning and Teaching

Keywords: Cultural psychology, Emotion and affect, Environmental education, Literacy, Qualitative methods, Social aspects of learning and teaching, Social interaction, Student learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 25 - Educational Theory

Chairperson: Geerte M. Savenije, University of Amsterdam, Netherlands

Perezhivanie: children's accounts of shifting identities and emotional learning in place

Keywords: Emotion and affect, Environmental education, Literacy, Social aspects of learning and teaching

Presenting Author:Peter David Renshaw, The University of Queensland, Australia; **Co-Author:**Ron Tooth, Pullenvale Environmental Education Centre, Australia

We investigate the intersection between children's emotional experiences in place, their changing sense of self, and literate practices. Our purpose is to track how emotional experiences (perezhivanie) in natural environments are transformed into texts and communicative practices that express changes to children's sense of self across time. Our research is distinctive in applying perezhivanie to children's emotional experiences in natural settings and the literate practices and artefacts that arise from such experiences. The data were drawn from an on-going design research project on place-responsive pedagogy conducted at Pullenvale Environmental Education Centre. Analyses of the written accounts of an excursion to Karawatha Forest by 108 children (50 girls and 58 boys) were conducted to identify emotionally engaging moments and children's sense of shifting identities related to their experiences at Karawatha. The children were from upper-primary classrooms (sampled from four different schools), and about 12 years old. The task of writing the account was described to the children as an opportunity to share what had happened to them on the excursion, and how they felt about their experiences. The accounts reveal emotional engagement for almost all the children and notable shifts in their sense of self. Some of the accounts by children are compelling and surprising revealing heart-felt emotional moments that triggered reassessments of their identities - who they were and who they were becoming. Our data suggest that perezhivanie - lived emotional experiences in place - are the springboard for deeper learning about oneself and a pivot for expansive literacy learning.

An Indigenous student's emotive reading experiences and the evolution of reader identities

Keywords: Emotion and affect, Literacy, Social aspects of learning and teaching, Student learning

Presenting Author:Clarence Ng, Australian Catholic University, Australia

Using longitudinal mixed-method design, this paper examines an Indigenous Australian student's (Lisa; pseudonym) emotive lived experiences in reading in different settings (perezhivanie) and relate them to her reader identities that she constructed in each setting. Over three years, data were drawn from classroom observations, interviews, and surveys which Lisa had participated. In developing this longitudinal case, the interviews were taken as the main data source while other data were used to complement, verify and extend the findings. To further triangulate the findings, Lisa's case was presented to different teachers who had worked with her for verification. The findings showed that Lisa held different identities in multiple settings over three years, which include reader identities as a disengaged and low-achieving reader among her non-reader friends in the class (Year 5), a hiding reader enjoying reading novels at home (Year 5), a capable reader who had significantly improved her reading performance in school (Year 6), and a nervous but proud reader who read to elderly people at a retirement village (Year 7). These multiple, shifting, and at one stage, inconsistent identities were examined based on the concept of perezhivanie, highlighting the unity of emotion and cognition and refracted moments where Lisa managed to retain her agency and hold incompatible reader identities while responding to social influences to advance her own learning and social interests. The findings indicate the importance of providing unwavering support, trust and opportunities to disengaged readers from Indigenous backgrounds despite a lack of response at times.

Children's emotional sense-making of their local forest in a Multiliteracies pedagogy program

Keywords: Emotion and affect, Literacy, Social aspects of learning and teaching, Student learning

Presenting Author:Kristiina Kumpulainen, University of Helsinki, Finland; **Co-Author:**Sara Sintonen, University of Helsinki, Finland; **Co-Author:**Alexandra Nordström, University of Helsinki, Finland; **Co-Author:**Jenni Vartiainen, University of Helsinki, Finland; **Co-Author:**Heidi Sairanen, University of Helsinki, Finland

This paper investigates the nature of children's literate practices in relation to their emotional sense-making of their local forest situated in a Multiliteracies pedagogy program underscoring play, imagination and story-telling. Our purpose is to examine how children's emotional sense-making of their local forest is transformed into multimodal, digital texts and communicative practices that express what children know (epistemology), who they are becoming (ontology), and what they value (axiology). Our theoretical framing draws upon sociocultural theorizing, in specific, on Vygotsky's (1934) concept of perezhivanie and the notion of dynamic literacies (Potter & McDougall, 2017). The empirical data derive from an ethnographic case study of the implementation of the Multiliteracies Program in a Finnish Early Childhood Education (ECE) center including 20 children (aged 6 to 7 years old) and their teachers. The data for this study consist of observational field notes and video-recordings of the whole project as well as children's multimodal artefacts and stories. Our analysis of the data draws on Lynch's (Lynch, 2007) ethical analysis of affective labour with a specific analytic attention on meanings of love, care and solidarity in the children's literate practices and artifacts. Our research offers insights for the study and enhancement of children's emotional sense-making of their local environment for learning, wellbeing and sustainable living via a Multiliteracies pedagogy.

Uses of "chronotope" to examine the space-time of learning: A systematic literature review

Keywords: Cultural psychology, Qualitative methods, Social aspects of learning and teaching, Social interaction

Presenting Author:Giuseppe Ritella, University of Helsinki, Finland; **Co-Author:**Antti Rajala, University of Helsinki, Finland; **Co-Author:**Peter David Renshaw, The University of Queensland, Australia

The aim of this study is to review the literature adopting the dialogical notion of chronotope to examine space-time relations of learning. Crafted from the ancient Greek words *chronos* and *topos*, meaning time and place/space, chronotope was devised by Mikhail Bakhtin to develop a framework for the cultural analysis of space-time. The rationale of this investigation is that a growing number of educational studies is currently adopting this concept, indicating its usefulness for a wide range of educationally relevant topics. However, a comprehensive discussion of its overall significance and scope for our understanding of learning and education is still missing. In our view, this is a crucial step for the development of this theoretical tradition. We conducted a literature search in ERIC and PsycInfo, analysing 164 references. The researchers have met periodically to discuss the preliminary findings while completing the analysis of the full texts. The conclusive findings will be shared in the conference. Firstly, chronotopes have been used to guide detailed analyses of classroom processes and how specific space-time relations enable and constrain students' identity work. Secondly, chronotope has been deployed to represent culturally typical movements and paces of educational activities. Thirdly, chronotope has been used to analyse the relationship between ideological orientations and sensemaking during educational activities. We claim that the present paper can contribute to theorizing the space-time relations of learning and education, opening up opportunities to examine today's and to re-think tomorrow's educational practices not overlooking the impact of space-time relations.

Session Q 17

15 August 2019 17:15 - 18:45

Seminar Room - S03

Single Paper

Assessment and Evaluation

Psychometrics, Assessment and Evaluation

Keywords: Assessment methods and tools, Attitudes and beliefs, Competencies, Comprehension of text and graphics, Culture, Higher education, Psychometrics, Quantitative methods, Self-efficacy, Survey Research, Video analysis

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Oddny Judith Solheim, Norway

Assessment of Communication Competences of Medical Students in Two Cohorts: A Multi-Method Study

Keywords: Assessment methods and tools, Competencies, Psychometrics, Video analysis

Presenting Author:Kristina Schick, Technical University Munich, Germany; **Co-Author:**Pascal Berberat, Technical University Munich, Germany; **Co-Author:**Martina Kadmon, University Augsburg, Germany; **Co-Author:**Sigrid Harendza, University Hospital Hamburg-Eppendorf, Germany; **Co-Author:**Martin Gartmeier, Technical University of Munich (TUM), Germany

Assessment of communication competence plays an important role in undergraduate medical education. The Kalamazoo Communication Skills Assessment Form (KCSAF) is an assessment tool developed for different methods to assess communication competences. Beside an assessment with trained raters, the students' self-appraisal and the standardized patients' views are considered. This study describes the translation and adaptation of the KCSAF for German speaking countries and its psychometric properties. N = 163 simulated consultations of n = 97 medical students in their first clinical year and n = 66 students in their final year of undergraduate medical education were videotaped. After the consultations, students and standardized patients assessed the performance of the students with *KCSAFd* either for students' self-appraisal (*KCSAFd-self*) or standardized patient assessment (*KCSAFd-sPat*). Afterwards, trained raters assessed communication competence of the participating students with the *KCSAFd-video*. Empirical analyses of the content and convergent validity showed good psychometric properties. Internal consistency of all three methods was good. A two-dimensional model, which distinguished between conversational and interpersonal competence, provided good model fits for the methods "*KCSAFd-self*" and "*KCSAFd-sPat*". However, the "*KCSAFd-video*" showed the weakest model fit. The three methods could also differentiate between performance and educational levels. To summarize, *KCSAFd* is a valid and reliable instrument to assess communication competence at different levels of undergraduate medical education from various perspectives.

Quantitative Semiotic Analysis of Test Items: Conceptual and Methodological Foundation

Keywords: Assessment methods and tools, Comprehension of text and graphics, Culture, Psychometrics

Presenting Author:Guillermo Solano-Flores, Stanford University, United States

This paper discusses the possibilities of semiotic analysis in the design of test items in educational assessment. With a focus on the frequency of multiple textual and graphic features of test items, this approach provides the formal basis for studying response processes and, more specifically, the relation between semiotic complexity and student performance. The paper discusses several empirical studies that illustrate the use of quantitative semiotic analyses in research involving the testing of culturally and linguistically diverse populations, as is the case of international test comparisons. The quantitative semiotic analysis of test items also allows identification of test design features that contribute to construct-irrelevant variance.

Creative self-beliefs of children and adolescents: A construct validation study

Keywords: Psychometrics, Quantitative methods, Self-efficacy, Survey Research

Presenting Author:Paul Ginns, The University of Sydney, Australia; **Co-Author:**Kelly Freebody, The University of Sydney, Australia; **Co-Author:**Michael Anderson, The University of Sydney, Australia

In the current climate of workplace change due to rapid automation and computerization, schools have become critical sites for change in our community (Jefferson & Anderson, 2017). Creativity is consistently identified as a critical capacity for these changes (Frey & Osborne, 2017) and yet schools are not adequately prepared to develop creativity in a systematic and methodical manner (Jefferson & Anderson, 2017). As part of a larger programme of research on students' and teachers' experience and development of creativity, in the present study, we sought to develop and validate self-report measures of students' self-beliefs regarding creativity suitable for children and adolescents. We took a construct validation approach, drawing on available research on relations between personality (openness/intellect, conscientiousness) and creative self-belief (creative self-efficacy, creative mindset) constructs to test convergent and discriminant validity hypotheses. Confirmatory factor analysis supported the hypothesised factor structure, with the adapted measures evincing acceptable levels of internal consistency (McDonald's omega > .80). Evidence supporting each of the convergent and discriminant validity hypotheses is presented. The present study provides a foundation for subsequent intended research linking students' personality and creative self-beliefs with their classroom experiences of creativity.

Exploring Assessment profiles of HE Academics: A Combination Between Conceptions & Practices

Keywords: Attitudes and beliefs, Higher education, Psychometrics, Quantitative methods

Presenting Author:Percy Pena, Universidad Católica del Norte, Chile

This paper examines the validity and reliability of a new inventory for measuring the academic teaching assessment conceptions and practices of a Chilean university, Academics Teaching Assessment Inventory (ATA-I). Data were collected from 237 academics belonging to the Faculties of Humanities, Engineering, and Medicine. The questionnaire was developed based on a literature review reporting academics' assessment conceptions and practices. After an exploratory and confirmatory factor analyses, a four-factor solution appropriate to the proposed model was found. Acceptable reliability coefficients in all scales and better fit are observed for Practices than for Conceptions. To uncover some differences within groups, a cluster analyses was conducted. We suggest that this inventory could be helpful for trying to understand the assessment conceptions and practices of university teachers.

Session Q 18

15 August 2019 17:15 - 18:45

Seminar Room - S09

Single Paper

Educational Policy and Systems, Higher Education, Learning and Instructional Technology

Mixed-method Research and Educational Technology

Keywords: Assessment methods and tools, Attitudes and beliefs, Computer-supported collaborative learning, Culture, E-learning/ Online learning, Early childhood education, Educational technology, Inquiry learning, Language (Foreign and second), Mixed-method research, Science education

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Helen Margaritou-Andrianessi, Greece

Unpacking academic and social adjustment of internationalisation at a distance in Southern Africa

Keywords: Culture, E-learning/ Online learning, Educational technology, Mixed-method research

Presenting Author: Bart Rienties, Open University, United Kingdom; **Co-Author:** Jenna Mittelmeier, University of Manchester, United Kingdom; **Co-Author:** Jo Jordan, Open University, United Kingdom; **Co-Author:** Jekaterina Rogaten, Open University, United Kingdom; **Co-Author:** Ashley Gunter, UNIVERSITY OF SOUTH AFRICA, South Africa; **Co-Author:** Parvati Raghuram, Open University, United Kingdom

With the rise of technology and distance learning, a new type of internationalisation of higher education seems to be emerging in Southern Africa higher education, which we coin as Internationalisation at a Distance. In this mixed-method study, we aim to provide an initial attempt to theorise the concept of Internationalisation at a Distance through an in-depth analysis of 1295 students' experiences while studying at the largest distance learning institution in Africa. Using an adjusted version of the Student Adaptation to College Questionnaire (SACQ) instrument developed by Baker and Siryk (1999), we have explored the study experiences of international students living abroad, as well as South Africans and international students living in South Africa. Our regression models indicated that academic adjustment is significantly predicted by emotional adjustment, attachment towards the institution, access to technology, and internationalisation at home students. Follow-up interviews with 40 participants indicated a need for a much more complex narrative around internationalisation in distance learning settings in light of technological advances, requiring a potential reconsideration of what internationalisation 'abroad' and 'at home' might mean.

Online Peer Assessment on Enhancing College Language Learners' Intercultural Pragmatic Competence

Keywords: Assessment methods and tools, Computer-supported collaborative learning, Language (Foreign and second), Mixed-method research

Presenting Author: Mei-Hui Liu, Tunghai University, Taiwan

This yearlong study examined the effectiveness of employing online peer assessment (PA) on enhancing foreign language (FL) learners' intercultural pragmatic competence (IPC). In the higher education context, scholars and researchers have advocated the cultivation of IPC which has direct relationship with language learners' communicative competence in this globalization era. Nonetheless, there is a concern that it is not always an effective way to assess and improve learners' IPC by solely relying on course instructors' summative evaluation scores. While PA has been recognized as a potential strategy for helping students with language learning, a scarcity of research was related to the impact, if any, of online PA on developing learners' IPC, especially by involving cross-cultural peers to mutually improve each other's performance in the target language. Through the theoretical lenses of social constructivism and speech acts, this study collected multiple data sources from 45 college students learning Chinese or English as a foreign language (N=15 and 30 respectively) as well as 6 language professionals. Data sets included surveys, (focus group) interviews, expert review outcome of video-taped role plays, and peer feedback/ratings to role plays. The research questions covered 3 major issues: 1) to document the participants' perceptions of this cross-cultural online PA learning project, 2) to examine the effectiveness of this project on enhancing FL learners' IPC, and 3) to document the concerns or challenges these learners may encounter during this learning-oriented PA process. Pedagogical implications and research suggestions are provided based on the findings and limitations of the current study.

Individual attitudes of educators to digital media education and possible explanatory models

Keywords: Attitudes and beliefs, Early childhood education, Educational technology, Mixed-method research

Presenting Author: Jasmin Zimmer, Alanus Hochschule, Germany

Political authorities and educational bodies seem to agree that children should learn how to use digital media as early as in early childhood education. On the other hand, more than two-thirds of the parents surveyed are more or less opposed to their children being taught digital media literacy in kindergartens. Moreover, educators and scientists of various disciplines reject the early contact with digital media. How can this discrepancy between the demands of politics and the will of educators, but also the opinion of experts for childhood such as paediatricians, psychologists, etc. be understood? How do educational actors develop their attitude towards this topic? We have investigated the attitude of future and actual educators to the field of digital education and possible connections between attitudes, media and media pedagogic competence as well as media socialisation. In a quantitative and qualitative survey, we have asked educators and students of childhood education, about their media literacy and their attitude to digital media, and have evaluated the answers. Existing explanatory models focussing only on the use of digital media, are challenged by the hermeneutical analysis of the qualitative data. Practitioners' theories tend to be more complex, including several developmental stages with their respective goals and assessment of several media types regarding their assumed suitability in the various stages of this process. Quantitative data support these findings. We shall discuss the results in the light of a better understanding of the discrepancy mentioned above and point out trajectories for our further research.

Improving Knowledge Integration Using WISE

Keywords: Educational technology, Inquiry learning, Mixed-method research, Science education

Presenting Author: Beste Ulus, Boğaziçi University, Turkey; **Co-Author:** Diler Oner, Bogazici University, Turkey

In this mixed-methods study, we examined the use of a web-based inquiry science environment (WISE) unit to improve knowledge integration (KI) of middle school students with no prior inquiry instruction experience. A unit on heat and temperature (H&T) was newly designed and developed using the WISE legacy authoring tool reflecting KI principles and processes. A KI instrument for H&T was developed and used to evaluate students' KI levels. The WISE logs of three students with different KI improvement levels were qualitatively analyzed to understand the more critical KI processes that could explain different levels of KI improvement using a bottom-up approach. The results showed that 7th-grade students with no prior inquiry instruction significantly improved their KI levels after participating in the WISE-based unit on H&T. Moreover, revising a step, revision quality, and reflection were found to be the critical factors that could explain different KI gains. These findings highlighted the need to better scaffold and support especially two of the KI instructional processes, distinguishing among ideas and sorting out ideas, particularly in settings where students have no prior inquiry experiences in science classes.

Session Q 19

15 August 2019 17:15 - 18:45

Seminar Room - S11

Single Paper

Learning and Social Interaction, Teaching and Teacher Education

Teacher Education and Social Interaction

Keywords: Comparative studies, Content analysis, Educational policy, Language (L1/Standard Language), Mixed-method research, Motivation and emotion, Reflection, Social interaction, Teacher professional development, Teaching approaches

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education

Chairperson: Mordechai Miron, Tel Aviv University, Israel

Formative seminars to explore teachers' conceptualization of grammar teaching for learning to write

Keywords: Language (L1/Standard Language), Reflection, Social interaction, Teaching approaches

Presenting Author:Xavier Fontich, Autonomous University of Barcelona, Spain

This paper presents the results of a study conducted in Spain concerning primary school teachers' conceptualizations of grammar teaching and its relation to writing. While a general tendency locates (a) the grammar teaching within the implicit-explicit grammar knowledge dichotomy and within a transmissive setting of direct instruction, a formative seminar with teacher participants aims at (b) exploring the extent to which ideas that could be grouped around the category of "metalinguistic activity" and that of "socio-constructivist pedagogy" emerge out of teacher interaction. Metalinguistic activity is considered a promising avenue for research into grammar-writing teaching and learning: it refers to any verbal or procedural activity that has, as referent, the oral or written language itself, which is taken as the focus of observation, reflection and analysis, as a way (according to socio-constructivist tenets) for learning. The analysis of the seminar sessions shows that teachers' procedures when teaching grammar and writing are mostly influenced by the former (a); however, ideas related to (b) emerge as well, albeit in an unstructured and intuitive way. This suggests that, while the latter shows the benefits of formative seminars for teacher education, it also suggests the need teachers have for enhancing this perspective upon the grammar-writing issue.

The influence of mentoring roles in student teachers' professional knowledge acquisition

Keywords: Mixed-method research, Reflection, Social interaction, Teacher professional development

Presenting Author:Paul Hennissen, Zuyd University of Applied Sciences, Netherlands; **Co-Author:**Juan-José Mena Marcos, University of Salamanca, Spain

It is widely acknowledged that mentoring conversations help student teachers (ST) to recognize and explicate their developing professional knowledge. However, it is yet unclear what kind of knowledge STs develop during those mentoring conversations. This study explores how specific mentoring roles influence STs knowledge development. A mixed methodology was applied with analysis based on examining mentoring conversations in relation to the MERID-model through turn-taking analysis and Propositional Discourse Analysis (PDA). Mentors tend to use a more directive mentoring approach and, consequently, the STs' acquisition of knowledge from their experience is low. Mentoring roles are influencing the acquisition of knowledge. Serious attention is needed for mentors are supporting STs' acquisition of knowledge.

Comparative study of new pathways into teaching in Malta and Scotland

Keywords: Comparative studies, Educational policy, Social interaction, Teacher professional development

Presenting Author:Michelle Attard Tonna, University of Malta, Malta; **Co-Author:**Rachel Shanks, University of Aberdeen, United Kingdom

With recruitment and retention problems in many countries there has been growing diversification of teacher preparation routes. While these new routes operate in different contexts they share some elements, for example being part-time and/or online. Alternative routes to teaching open new opportunities to enter teaching and also engage schools as an important environment for teachers' professional learning. This comparative study is set within the current policy agendas in Malta and Scotland. A critical realist approach was taken to understand how solutions to address teacher shortages have operated in different contexts within and between the two countries. It is too early to compare retention rates for the newest routes, however we can determine which have been the most popular to date, and which ones attract candidates with particular characteristics, for example which routes attract a higher proportion of men for primary school teaching. This comparative study provides a typology of teacher preparation routes which could be used to make comparisons in other European countries and beyond.

Teacher-Student-Interactions in Situations with Primary School Children's Anxiety

Keywords: Content analysis, Motivation and emotion, Social interaction, Teacher professional development

Presenting Author:Juliane Schlesier, University of Oldenburg, Germany; **Co-Author:**Uta Wagener, University of Oldenburg, Germany; **Co-Author:**Barbara Moschner, Carl von Ossietzky Universität Oldenburg, Germany

Anxiety is one of the most investigated achievement emotions (Frenzel, Götz, & Pekrun, 2015). It is known, that teacher-student-relationships and achievement emotions (including their regulation) are closely related to each other. Nevertheless, fundamental research on teacher-student-interactions regarding students' anxiety is a research gap. Accordingly, it is the aim of this study to investigate teachers' beliefs about teacher-student-interactions in situations with primary school children's anxiety. For this purpose, 20 guideline-based, semi-structured interviews were analyzed in a first step via an inductive qualitative content analysis according to Mayring (2015). Afterwards, a deductive, structured content analysis was carried out with these interviews. Preliminary findings show several triggers, interpretation of the students, student behaviour, teachers' interpretation, teachers' behaviour, and finally consequences. Since teachers interpreted students' behaviour in situations of anxiety (like refusing further working) predominantly as a lack of self-control, it seems that teachers believe that anxiety indeed is an achievement emotion, which should be regulated in classroom contexts.

Session Q 20

15 August 2019 17:15 - 18:45

Lecture Hall - H09

Single Paper

Teaching and Teacher Education

Teacher Professional Development

Keywords: Assessment methods and tools, Case studies, Competencies, Computer-supported collaborative learning, In-service teacher education, Learning approaches, Pre-service teacher education, Primary education, Reflection, Teacher professional development, Video analysis

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development

Chairperson: Guido Nottbusch, University of Potsdam, Germany

Evidence-Based Feedback Analysis through Video-Annotation in a Swiss Teacher Training Program

Keywords: Computer-supported collaborative learning, Reflection, Teacher professional development, Video analysis

Presenting Author:Alessia Evi-Colombo, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Elena Boldrini, Swiss Federal Institute for Vocational Education and Training (SFIVET), Switzerland; **Co-Author:**Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Switzerland

Reflection on action can be fostered through receiving formative feedback provided by an agent, and progressively, through self-generated feedback. In a situation-based instructional approach, the analysis of authentic video-recorded situations supported by video annotation constitutes a valuable means for managing feedback and self-observation. A pilot study with 36 in-training teachers, including analysis and feedback activities on teaching situations, and a self-analysis on one's own lesson was designed, foreseeing two conditions: teachers providing feedback through video-annotation on video-recorded lessons, and teachers delivering feedback based on direct observation of peers' lessons. A final activity of analysis on an unknown teacher's lesson was also conducted. The study aimed to test the feasibility of the instructional model to be steadily integrated in the teacher education program; evaluate the impact of video analysis and annotation on teachers' reflective skills, assess the effects of using video-annotation on the quality and quantity of feedback. Preliminary results reveal positive evaluation of the training by the participants in terms of perceived efficacy and feasibility. Concerning the development of reflective skills, teachers working in the video-annotation condition were able to identify more indices in the video-recorded lesson and to rework them in terms of alternatives of action than their colleagues working in the direct observation condition. Analysis on the quality and the quantity of reciprocal and self- feedback showed a progressive and significant increment in terms of elements related to alternatives of action, shedding light on the value of video-annotation in focused evidence-based training.

Is the competent perception of a lesson a necessary condition of a competent teaching performance?

Keywords: Competencies, Pre-service teacher education, Teacher professional development, Video analysis

Presenting Author: Sarah-Larissa Hecker, Universität Bielefeld, Germany; **Co-Author:** Stephanie Klein, Universität Bielefeld, Germany; **Co-Author:** Svenja Lemmrich, Leuphana University Lüneburg, Germany; **Co-Author:** Timo Ehmke, University of Lüneburg, Germany; **Co-Author:** Barbara Koch-Priewe, Universität Bielefeld, Germany

This paper analyses the correlations between teachers' perception of and simulated performance in teaching situations that are part of a video-based test. According to the results of a first quantitative-descriptive evaluation of the data of 134 participants, tasks on "perception" and "simulated performance" are not equally difficult. A further qualitative analysis of the responses of those test subjects who scored well in their simulated performance although they had received zero points in their perception of the situation suggests that this can be associated with teacher expertise characteristics as well as the test setup in video-based competence tests for teachers in general.

Feedback Coaching: Collaborative professional learning to build effective feedback processes

Keywords: Assessment methods and tools, Learning pedagogues, Primary education, Teacher professional development

Presenting Author: Rochelle Burton, The University of Queensland, Australia; **Co-Author:** Annemaree Carroll, The University of Queensland, Australia; **Co-Author:** Cam Brooks, The University of Queensland, Australia; **Co-Author:** John Hattie, The University of Melbourne, Australia

This paper draws on empirical evidence to explore teacher perceptions and changes in teacher feedback practices by Australian primary teachers. This qualitative intervention study combined evidence-based practices of instructional coaching, feedback and formative assessment practices based upon existing theoretical frameworks and research. The combination of these frameworks created a feedback coaching model to help answer the research question: *What is the effect of a feedback coaching model upon teacher perceptions and classroom practices?* Utilising a qualitative research method, data were collected to highlight teachers' perceptions of feedback coaching and the impact of this coaching upon classroom feedback practice. Results demonstrated that teachers' perceptions of feedback changed as a result of the feedback coaching intervention and importantly that teachers reported changes to classroom practice due to a shift in knowledge and understanding of feedback behaviours being aimed at activating the learner.

Listening to teachers, reaching the goals in video-based PD: A case study on facilitator expertise

Keywords: Case studies, In-service teacher education, Teacher professional development, Video analysis

Presenting Author: Susanne Prediger, TU Dortmund University, Germany; **Co-Author:** Birte Pöhler, TU Dortmund University, Germany

Video-based professional development (PD) programs have been shown to be efficient for the PD of teachers as they allow building upon teachers' experiences with respect to the PD goals. However, the realization of the video-based PD heavily depends on the facilitators' practices of leading the discussions; this includes specifically the situational demands of listening to the participants and reaching the PD goals, which are investigated here. The current case study consists of $n = 5$ facilitators who facilitate a video-based PD program on the content of language-responsive mathematics teaching. Within the theoretical framework of content-related facilitator expertise, the case study investigates facilitators' practices in the PD and their video-stimulated reflections by in-depth qualitative analysis aiming at identifying the activated orientations and categories underlying the facilitators' practices. The analysis shows that successful facilitators succeed in not only transmitting their own pedagogical content knowledge about language-responsive mathematics teaching, but in noticing the participants' pedagogical content knowledge and orientations and in bridging them towards the PD goals by adequate categories. This noticing requires categories on teacher's learning as well as on community building. The study is of theoretical relevance as it underpins the theoretical framework on content-related facilitator expertise and identifies the concrete categories for the content of language-responsive teaching. Based on these empirically grounded theoretical contributions, the results of the case study have direct impact for facilitator preparation programs which should comprise a focus on teachers' content-specific learning, especially (but not solely) in video-based PD programs.

Session Q 21

15 August 2019 17:15 - 18:45

Lecture Hall - H05

Symposium

Learning and Social Interaction, Teaching and Teacher Education

Models of teacher professional development to support classroom dialogue: Struggles and successes

Keywords: Argumentation, Collaborative Learning, Communities of practice, Conversation/ Discourse analysis, Inquiry learning, Mathematics, Morality, Teacher professional development

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Sara Hennessy, University of Cambridge, United Kingdom

Organiser: Sara Hennessy, University of Cambridge, United Kingdom

Discussant: Jonathan Osborne, Stanford University, United States

This symposium takes a critical perspective on models of teacher professional development (TPD) programmes intended to support more dialogic approaches to teaching and learning, namely those whereby participants engage with, and constructively challenge, each other's ideas. Increasing attempts to shift pedagogical practices and improve student learning outcomes have been met with varied levels of success to date; we question why this is and strive to progress understanding in the field. This symposium highlights the multiplicity of models underlying contemporary programmes internationally and considers their merits and pitfalls. We report on recent attempts to promote dialogue and argumentation in school settings in diverse contexts (Chile, England, Israel, New Zealand and USA), mentioning their substantive findings. However our emphasis is on scrutinising the TPD models and processes, and the factors facilitating or constraining successful implementation and outcomes. These include the varying levels of support and structure provided. Further methodological issues related to TPD timescales, teacher motivation and ownership, intervention fidelity, sustainability and scalability, are also examined. We aim to provide an honest appraisal of the obstacles faced, which is needed for the field to meet the real challenge of supporting practitioners in developing higher quality dialogue and argumentation. This critical analysis has timely and important implications for teachers, teacher educators, school leaders and others developing and implementing TPD programmes and policies.

T-SEDA: A flexible research-informed PD approach to teacher inquiry into dialogue

Presenting Author: Ruth Kershner, University of Cambridge, United Kingdom; **Co-Author:** Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:** Jane Tilson, University of Otago, New Zealand; **Co-Author:** Benzi Slakmon, Hebrew University, Israel; **Co-Author:** Elisa Calcagni, University of Cambridge, United Kingdom; **Co-Author:** Laura Kerslake, University of Cambridge, United Kingdom; **Co-Author:** Farah Ahmed, University of Cambridge, England, United Kingdom; **Co-Author:** Helen Trevethan, University of Otago, New Zealand; **Co-Author:** Susan Sandretto, University of Otago, New Zealand; **Co-Author:** Sarah Seleznyov, Southwark Teaching Schools Alliance, United Kingdom

Practitioners in schools and colleges are increasingly aware of the potential of dialogic approaches for student learning (e.g. Alexander 2008; Mercer and Littleton 2007). However, the challenge for many educators is to make full use of up-to-date research knowledge and methods. Researchers are similarly challenged to promote the meaningful impact of research findings. We present the design and empirical trials of a teacher professional development (TPD) approach involving systematic inquiry by teachers into the quality of dialogue in their classrooms. The Teacher Scheme for Educational Dialogue (T-SEDA) draws on cutting-edge research about forms of dialogue associated with student outcomes. It offers teachers extensive resources including a self-audit, inquiry cycle template, dialogue coding framework, systematic live observation tools, case studies and video exemplars (<http://bit.ly/T-SEDA>). We report on its iterative development and impact trials with teachers and researchers in England, Israel, New Zealand and Australia who implemented a range of TPD models including remote assistance, face-to-face workshops and a schools network approach. Selected examples illustrate how different models of effective TPD for dialogue develop within the affordances of existing professional learning contexts. We conclude that an unusually flexible TPD model is required to reduce the support needed from an external research team and promote scalability and sustainability. This involves building on local TPD practices, collaborating with local

research leaders, responding to teachers' own interests, and providing high-quality materials for teachers to use and adapt in their own diverse contexts.

Sustainability of scaffolding student argumentation: a follow-up study of an in-service program

Presenting Author:Baruch Schwarz, Hebrew University of Jerusalem, Israel; **Co-Author:**Irit Cohen, The Hebrew University of Jerusalem, Israel

Research has repeatedly demonstrated that high quality small group discussions promote impressive learning outcomes ranging from the promotion of critical thinking to the promotion of social skills. Studies have also shown that teacher scaffolding of argumentation results in appropriation of practices and norms instilled by the teacher when students reason collaboratively in autonomous groups. However research so far has focused on small groups taken out of school, to the laboratory, with instructors who offer expert guidance. Moreover the long-term effects of interventions are very rarely investigated. This paper presents a study conducted in authentic classroom settings in Israel, where teachers worked separately with small groups in consecutive activities. The teachers were initially inexperienced in scaffolding argumentation. They participated in an eight-week long in-service program in which they reflected on their guidance of small group discussions on texts around moral dilemmas. The quality of guidance and the accountability and argumentativeness of talk progressively improved in group discussions and consequently snowballed to whole-class discussions as groups shared their learning from the private arena. Importantly, a unique follow-up study showed that the effects persisted six months after the teachers underwent the intervention program. These effects propagated on unguided discussions, although the quality of these unguided discussions was inferior to the guided ones. Despite the progress made in the quality of talk, teachers still encountered difficulties in facilitating student elaboration of complex arguments. Our own learning from these difficulties led to developing a new, targeted intervention program for inexperienced teachers.

Issues arising from the multi-site implementation of a school-run dialogic pedagogy program

Presenting Author:Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:**Elisa Calcagni, University of Cambridge, United Kingdom

Interest in dialogic pedagogy and in teacher professional development [TPD] for its promotion is growing internationally (e.g. Lefstein & Snell, 2014). Interventions often involve intensive, small-scale communities facilitated by researchers, making scaling up challenging (Osborne, 2015). This work is part of a multi-site TPD study (Borko, 2004) to promote dialogue in primary mathematics in Chile that had demonstrably positive impact on teachers' practices. The year-long program was designed for scalability through lower costs, local facilitation and detailed materials. It included an induction for peer-facilitators who then led 10 teacher sessions.

This paper aims to assess feasibility and characterise implementation in three participating schools. Schools A and B completed the program, while C dropped out halfway. Thematic analysis was applied to interviews with 5 teacher-facilitators from all schools, and teachers (7) and school leaders (3) from A and B. In A and B, leadership teams linked the program with the school's TPD agenda, allocated time and monitored progress. In C, leaders did not secure time and were less involved. Facilitators in A and B understood their role as convening the sessions while acting as co-learners during the conversations with peers, sometimes adapting the activities to enhance feasibility. C facilitators, in turn, thought they required more knowledge about dialogic teaching, asking for expert support. Therefore, feasibility was impacted by how participants interpreted and enacted the TPD. Evidence about how the enactment of key roles in school-run TPD differ across schools and from researcher-led programs is crucial in moving scalable TPD designs forward.

Designing a model of professional development to support teachers' facilitation of argumentation

Presenting Author:Ian A.G. Wilkinson, University of Auckland, New Zealand; **Co-Author:**Alina Reznitskaya, Montclair State University, United States

In this paper, we describe the iterative process by which we designed a professional development program to support teachers' facilitation of argumentation in English language arts classes. Using a design study methodology, we developed and tested the model over three years, working in collaboration with 49 language arts teachers of fifth grade (children aged 10-11) at two sites in USA. Each year constituted a new iteration of the program with a new cohort of teachers, using various combinations of workshops, study groups, and in-class coaching. Although teachers struggled with various aspects of the program, each cohort showed substantial shifts in teacher facilitation of argumentation. Drawing on data collected from focus group interviews with teachers over the three years, we describe how we modified the program in response to teacher feedback. The project culminated in a small-scale, cluster randomized trial of the program and the formulation of a set of design principles to inform future implementations of professional development aimed at supporting teachers' facilitation of argumentation. Key features of successful implementation of the program were embedding the teaching and learning of complex concepts (e.g., warrants) within the context of authentic activity—co-planning discussions—and fostering contingent responsivity between teachers' use of talk moves and the quality of argumentation in students' discussion.

Session R 1

16 August 2019 08:30 - 10:00

Seminar Room - S15

SIG Invited Symposium

SIG 26: Argumentation, Dialogue, and Reasoning in Education: Areas of Research and Practice

Keywords: Argumentation, Cognitive skills, Collaborative Learning, Computer-supported collaborative learning, Content analysis, Conversation/ Discourse analysis, Learning approaches, Reasoning, Science education, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Armin Weinberger, Saarland University, Germany

Organiser: Armin Weinberger, Saarland University, Germany

Discussant: Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

The notion of education as a process of conveying canon knowledge to learners often falls short of acknowledging how dynamic and complex areas of knowledge are and how learners should ultimately be able to participate in discourse in the respective fields. Thus, practices of argumentation, dialogue, and reasoning have entered education for enabling learners to critically review knowledge resources and take multiple perspectives on complex matters. In this symposium, we shed light on different areas of research within the newly founded SIG 26 "Argumentation, Dialogue, and Reasoning" on how epistemic practices are realized through argumentation in science and science education; how argumentation's social function of sharing focus and sharing reasons relate to learning in small groups and how this transactive argumentation can be developed for joint learning in new online arenas for debate; how educational practices and research itself can be reconceived as dialogic, broadening the focus beyond the cognitive aspects of learning to bring in the relational context and socioemotional dimension; and how teachers can be prepared for implementing progressive pedagogies of argumentation, dialogue and reasoning in the classroom from a systemic point of view.

Argumentation in Science Education as an Epistemic Performance

Presenting Author:Maria Pilar Jimenez-Aleixandre, University of Santiago de Compostela, Spain; **Co-Author:**Clark Chinn, Rutgers Graduate School of Education, United States; **Co-Author:**Pablo Brocos, University of Santiago de Compostela, Spain

The characterization of argumentation has shifted in the last decade from viewing it as participation in disciplinary discourse towards conceiving it as participation in epistemic practices. Along these lines, Barzilai and Chinn (2018) regard arguments, as well as models and explanations, as epistemic products that are created, evaluated and communicated through epistemic processes in accordance with epistemic *ideals* or standards. In this paper we draw from Barzilai and Chinn's analysis of apt *epistemic performance*, defined as the successful achievement of valuable epistemic aims. We analyze argumentation in terms of the five aspects of performance in their framework: cognitive engagement, adaptivity, metacognitive regulation and control, caring and enjoyment, and participation in epistemic performance with others. Each aspect is unpacked in terms of the aims, epistemic ideals, and reliable epistemic processes pertinent to that aspect (Chinn, Rinehart & Buckland, 2014). Mapping these five aspects of epistemic performance onto argumentation, in particular onto critical components of inquiry learning environments promoting argumentation, such as: developing epistemic goals about argumentation, and generating epistemic criteria for arguments (Jiménez-Aleixandre & Monteiro, in press), this paper develops a proposal for evaluating successful epistemic performance in argumentation in the context of science education.

Analysis and Facilitation of Transactive Argumentative Knowledge Construction Online

Presenting Author:Freydis Vogel, University of Nottingham, United Kingdom; **Co-Author:**Armin Weinberger, Saarland University, Germany

Online communication, e.g. on social media platforms, is a particular context for argumentative knowledge construction (AKC), since learners can mobilize additional resources and take the time they need to construct thought-through arguments. Computer-supported collaborative (CSCL) learning environments are developed to leverage benefits and compensate for problematic qualities of online communication. In these learning environments, scripting is an instructional approach aimed to facilitate social learning processes, such as transactive discussion, in which learners build on the reasoning of their peers, e.g. by generating opposing arguments on a shared topic. We will show exemplary research as well as meta-studies on how computers can be utilized to facilitate AKC by focusing on enhancing transactivity. Although scripting transactive argumentation has demonstrated strong effects, we conclude that the relation between transactivity and other learning processes is not yet clear, and the best way to design process-oriented instruction is only partially discovered so far.

Research on Dialogic Education

Presenting Author:Rupert Wegerif, University of Cambridge, United Kingdom; **Co-Author:**Sara Hennessy, University of Cambridge, United Kingdom

Dialogic education is not just teaching through dialogue but also teaching for dialogue. In practice dialogic education can look similar to education based on social constructivism but the underlying metaphor for meaning-making is different: dialogism has the metaphor of a spark across difference. Foregrounding the gap between perspectives has implications for educational design. In place of bridging difference to create common ground there is opening spaces to promote the creative tension of alterity. Researching dialogues dialogically is a challenge since many research traditions are monological, seeking the reduction of difference to one true perspective. Illustrations are given from two recent projects that struggle with how to research dialogic education dialogically. One approach is Hennessy and colleagues' collaborative work with practitioners conducting inquiry that develops and explores the consequences of teaching for dialogue in classrooms, including refining dialogic theory. Another is what we call a 'chiasm' design in which the voice of 'objectivity' looking as if from the outside is combined with the voice of living experience from the inside. The chiasm approach generates understanding in the form of a dialogue between inside voices and outside voices and is illustrated by work of Flecha, Soler and Garcia-Carrión.

Teacher Education for Scaffolding Argumentation, Dialogue and Reasoning in the Classroom

Presenting Author:Anat Yarden The Weizmann Institute of Science, Weizmann Institute of Science, Israel; **Co-Author:**Baruch Schwarz, Hebrew University of Jerusalem, Israel; **Co-Author:**Boris Koichu, Weizmann Institute of Science, Rehovot, ISRAEL, Israel; **Co-Author:**Michal Tabach, Tel Aviv University, Israel; **Co-Author:**Einat Heyd-Metzuyanin, The Technion Israel Institute of Technology, Israel; **Co-Author:**Benzi Slakmon, Hebrew University, Israel

In the last decades, various approaches have been suggested and elaborated to boost high-quality talk practices. Whatever the approach chosen is, its implementation at a large scale is complicated, though. We will describe a program initiated in 2018 in Israel to implement talk intended to boost dialogue, argumentation and reasoning in classrooms. Teachers in mathematics, science, history and civic education participate in a PD program. The teachers teach in the same classrooms, so that students participate in the same kind of talk in different disciplines. The program alternates between training in generic and domain-dependent practices of scaffolding small-group and whole-class talk, and in design activities in which such talk may emerge. We describe here the huge challenges that this program raises in Teacher Education, in curriculum development and in evaluation. In spite of these huge challenges, we will explain that policy-makers are highly interested in this epistemic change because they identify in programs such as ours opportunities for *education for citizenship*.

Session R 2

16 August 2019 08:30 - 10:00

Lecture Hall - H10

Symposium

Teaching and Teacher Education

Teachers' professional vision: How teachers look at their students

Keywords: Cognitive skills, Competencies, Language (Foreign and second), Mixed-method research, Motivation, Quantitative methods, Secondary education, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Doris Holzberger, Germany

Organiser: Katharina Schnitzler, Technical University of Munich, Germany

Organiser: Christian Kosel, TUM School of Education, Germany

Discussant: Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

AimsThis symposium wants to emphasize the importance of teachers' professional vision - *noticing of and reasoning about* classroom features by presenting recent results from four studies regarding teachers' professional vision in-action and on-action and/or applying eye-movement-tracking as a measurement of it. **Scientific and educational relevance**Two contributions compare professional vision in-action and on-action. Therefore, measuring teachers' vision during teaching and while observing teaching on video is critical. Both of it is possible through mobile and stationary eye-movement-tracking. The first study investigates systematic differences between the measurement of professional vision in-action and on-action with mobile and stationary eye-movement-trackers and outlines their differences and consequences of interpretation. Study two investigates the application of mobile eye tracking to put teachers in an actor perspective of their own classroom management. A comparison between professional vision in-action and on-action is drawn to investigate differences in teachers' noticing of relevant situations across expert and pre-service teachers. Two other contributions investigate pre-service teachers' noticing with regard to student behavior. The third study, finds that salient instead of unobtrusive student behaviors drive pre-service teachers' noticing of professional vision in-action. The fourth study, investigates which salient student behaviors are relevant for pre-service teachers to differentiate students into different learner groups that differ in their cognitive and motivational-affective characteristics when observing videos (professional vision on-action). These findings add on to prior research, which focused on interruptive salient student behaviors but did not investigate the role of positive salient student behaviors e.g. hand raising for teachers noticing and diagnostic competence.

Professional vision in and on action: Two sides of the same coin?

Presenting Author:Zuzana Baricova Smidekova, Masaryk University, Czech Republic; **Co-Author:**Mirosav Janik, Masaryk University, Czech Republic; **Co-Author:**Eva Minarikova, Masaryk University, Czech Republic

Professional vision, albeit a well-researched concept, has mostly been researched as professional vision on action, i.e. not in the act of actual teaching. Modern technologies, such as eye-tracking, allow us to explore also professional vision in action, i.e. when teachers actually teach (e.g. Cortina et al., 2015). This, however, bids the question how professional vision on action and in action differ. Our study aims to explore this using two methods of eye-tracking: we asked teachers to wear SMI 60 Hz eye-tracking glasses (ETG) during instruction. Later, sequences from a video tape of the same instruction (camera aimed at students) were replayed to the same teachers and their eye-movements were monitored (RED 250 mobile 250 Hz – remote ET). They were also asked to comment on the videos. Bearing in mind that these two viewpoints are very different, we opted for an in-depth analysis of the gaze replays from ETG and remote ET (concurrent viewing). This analysis takes into account the timeline of the video, the context, the events, and also the teacher's comments. The analysis is currently underway but preliminary results show that this approach is viable in exploring the differences between professional vision in and on action. The results will not only contribute to our knowledge of professional vision, but also to the theory of using video in teacher education.

Developing a coding scheme for verbalizations on professional vision during own classroom management

Presenting Author:Sharisse van Driel, Open University, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands; **Co-Author:**Frank Crasborn, Fontys University of Applied Sciences, Netherlands; **Co-Author:**Charlotte Wolff, University of Iceland, Iceland; **Co-Author:**Saskia Brand-Gruwel, Open University of the Netherlands, Netherlands

Although effective classroom management is critical for pupils' learning, many beginning teachers struggle with it. Teachers' professional vision, including noticing and interpreting of salient events, is a basis for such effective classroom management. However, little research exists that identifies professional vision and its relation with practical knowledge, with respect to teachers' own classroom management and expertise level. In our study in-training (n=22) and experienced (n=18) teachers in secondary education taught one lesson wearing eye tracking glasses, which record a video from the teacher's view during teaching. Teachers identified salient classroom management situations in-action (i.e., signaled during teaching) and on-action (i.e., signaled based on recording). After the lesson, teachers viewed the identified situations during a stimulated recall interview and reported on their experiences during teaching. We quantified these situations and we developed a coding scheme using content analysis to analyze teachers' verbalizations in terms of professional vision (1) and explicated practical knowledge (2). We analyze professional vision based on the 'learning to notice' framework of Van Es and Sherin (2002). We analyze teachers' practical knowledge in terms of the nature and content of interactive and stable cognitions. First analyses showed that in-training teachers noticed 179 salient classroom management situations (87 in-action; 92 on-action) and experienced teachers 126 situations (76 in-action; 50 on-action). Analyses of teachers' verbalizations based on the developed coding scheme in terms of expertise differences will be presented at the conference. Findings provide insight into teachers' professional vision as a basis for improving training in classroom management competencies.

How does student behavior attract preservice teachers' attention while instruction?

Presenting Author:Patricia Goldberg, University of Tübingen, Germany; **Co-Author:**Kathleen Stürmer, University of Tübingen, Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

To involve all students in active learning processes, teachers need to monitor students' engagement continuously in classroom interaction. However, previous research indicates that novice teachers have difficulties to focus on learning relevant information and thus distribute their attention unevenly across learners. To investigate whether preservice teachers' attentional processes are attracted by rather salient student behaviors, we investigated the frequency of gazes on observable student behavior as well as the relationship between the switchovers in preservice teachers' attention and the shown behavior. We synchronized preservice teachers' eye-tracking data in standardized teaching situations with continuous annotation of observable student behavior. Preliminary results show that if a certain behaviour is shown, preservice teachers are more likely to actually focus their attention on the respective behaviour when it is salient compared to when it is rather unobtrusive. The distribution of attention provides first indications that those salient behaviour indicators also elicit the switchovers in attentional focus of novice teachers. In a further step, time series analysis will be calculated to identify the patterns in attention attraction by students' behaviour.

Pre-service teachers' professional vision and their judgment accuracy of student profiles

Presenting Author:Katharina Schnitzler, Technical University of Munich, Germany; **Co-Author:**Christian Kosel, TUM School of Education, Germany; **Co-Author:**Doris Holzberger, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

This study aims to deeper investigate the processes on how students' cognitive and motivational-affective characteristics are diagnosed by considering the role of teacher professional vision. Students vary in their cognitive and motivational-affective characteristics, which are orchestrated in student profiles. To provide tailored instruction to students holding different profiles, teachers need to diagnose the profiles correctly. To diagnose student profiles, teachers need to *notice* and *reason* about critical classroom features and student behaviors, a competence known as professional vision. However, prior studies reported teachers' difficulties with accurate judgments and showed that teachers tend to notice and reason about irrelevant information. The present study aims to add on to prior research by investigating the judgment accuracy of pre-service teachers regarding student profiles as well as their noticing of relevant indicators. A sample of 43 pre-service teachers observed students from a short video, assigned them to different student profiles (strong, struggling, overestimating, underestimating, uninterested), and noted down their observations for the decision. Pre-service teachers noticed concordantly student behaviors for individual students but varied in their assignment of student profiles. Prevalent indicators are students' quantity of hand raisings, the quality of their answers, and students' attention toward the teacher. The pre-service teachers varied in their judgment accuracy across the different profiles: 68 % judged for example the 'uninterested' profiled student correctly, while the 'overestimating' profiled student was only identified by 27 % of them. Further analyses are needed to explore the interplay of noticing and reasoning such as pre-service teachers' diagnostic knowledge.

Session R 3

16 August 2019 08:30 - 10:00

Seminar Room - S11

Single Paper

Instructional Design

Experimental Studies in Instructional Design

Keywords: Computer-assisted learning, Design based research, E-learning/ Online learning, Educational Psychology, Experimental studies, Instructional design, Multimedia learning, Primary education, Problem-based learning, Teaching approaches

Interest group: SIG 06 - Instructional Design

Chairperson: Peter Edelsbrunner, ETH Zurich, Switzerland

How can we improve learning from texts? Combining effects of signaling and disfluency on learning

Keywords: Design based research, E-learning/ Online learning, Experimental studies, Instructional design

Presenting Author:Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Steve Nebel, Chemnitz University of Technology, Germany; **Co-Author:**Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany

Text-based learning environments are often used in primary, secondary, university, and online education. Two prominent design recommendations for improving learning instructional texts are the signaling principle (i.e., highlighting the most important information) and the disfluency principle (i.e. impairing the ease of identifying words). Despite their broad empirical base, a possible interaction of both effects was not examined up to this date. In the current experiment, 138 university students learned about tsunamis with a text-based learning environment. The instructional text was manipulated in terms of signaling (color cues versus no color cues) and disfluency (illegible font versus legible font). The results revealed that learners receiving the signaled material outperformed those who received the non-signaled material regarding their learning transfer performance. Disfluency had no impact on learning outcomes. Learning-enhancing results regarding signaling are explained with a reduction of perceived cognitive load. Disfluent texts led to higher metacognitive accuracy and invested effort but also to an enhanced cognitive load. Interaction effects could only be found in terms of metacognitive judgements.

Preparatory Effects of Problem Solving versus Studying Examples Prior to Instruction

Keywords: Educational Psychology, Experimental studies, Instructional design, Problem-based learning

Presenting Author:Christian Hartmann, Ruhr University Bochum, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:**Nikol Rummel, Ruhr University Bochum, Germany

Research on Productive Failure (PF; e.g. Kapur, 2014) has found support for the beneficial preparatory effects of problem solving prior to instruction. That is, attempting (and failing) to solve a problem prior to instruction makes students more receptive to the subsequent instruction, thereby improving their conceptual knowledge acquisition compared to a direct instruction (DI) approach in which instruction is provided first, followed by problem solving (Loibl, Roll, & Rummel, 2017). However, research did not yet establish conclusive evidence that generating own solution attempts prior to instruction explains the beneficial effects of PF. Literature on example-based learning suggests that a possibly equally effective means to prepare students for instruction could be to observe someone else engaging in problem-solving attempts. In an experimental study, we compared a PF-condition in which students were actively involved in own problem solving prior to instruction to two example-conditions in which students either observed the complete problem-solving process of another student engaging in PF or observed the outcome of this process (i.e. other student's solutions). We found that own problem solving was not superior to observing someone else's problem solving. Indeed, students who observed the entire PF-process even outperformed students who engaged in PF themselves. Additional analyses revealed that

the students' prior knowledge moderated this effect: while students in the example condition could take advantage of their prior knowledge to gain more conceptual knowledge from the subsequent instruction, prior knowledge did not affect students' post-test performance in the PF condition.

Effects of different learning environments on students' decision-making competence

Keywords: Experimental studies, Instructional design, Primary education, Teaching approaches

Presenting Author: Maria Tsapali, University of Cambridge, United Kingdom; **Co-Author:** Michelle R. Ellefson, University of Cambridge, United Kingdom

The focus of the present study is to explore different ways of training late primary school children to make informed decisions on socio-scientific issues that involve scientific knowledge and affect their local community and the society in general. An ongoing debate within educational and psychological circles is the effectiveness of constructivist teaching methods over explicit instruction. Studies have shown that students who construct the knowledge on their own are more likely to apply and extend that knowledge than those who receive explicit instruction. However, one of the main arguments against constructivist teaching techniques is based on the upgrade of our knowledge on information-processing system – human cognitive architecture. Current findings about human cognitive architecture provide evidence that explicit instruction produces significantly better outcomes than discovery learning ('minimal guidance during instruction') in teaching scientific concepts and processes. The main research aim of the present study is to identify which learning environment is the most efficient and establish some of the factors that predict the efficacy of one type of instruction over the others (e.g. previous content knowledge on the subject matter, previous decision-making skills, academic achievement, gender). An experimental pre-test post-test design with three learning conditions (explicit instruction, guided discovery and unguided discovery) and whole-class interventions was adopted. The sample consisted of 180 11-year-old students from four primary schools in central Greece. Preliminary findings have shown that explicit instruction has produced better learning outcomes for the overall population, while unguided discovery learning has produced poor results on children's decision-making competence.

Effective and Efficient Example-based Learning: Videos, Texts, or Graphic Novels?

Keywords: Computer-assisted learning, Experimental studies, Instructional design, Multimedia learning

Presenting Author: Markus H. Hefter, Bielefeld University, Germany; **Co-Author:** Inga ten Hagen, Bielefeld University, Germany; **Co-Author:** Claudia Krense, University of Freiburg, Germany; **Co-Author:** Kirsten Berthold, University of Bielefeld, Germany; **Co-Author:** Alexander Renkl, University of Freiburg, Germany

Despite living in the age of YouTube and MOOCs, is choosing video as the presentation mode of worked examples the best choice in terms of both effectiveness and efficiency? In two experiments with university students ($N_1 = 57$; $N_2 = 43$), we analyzed the effects of worked examples' presentation mode on their effectiveness and efficiency. The students self-explained different types of worked examples to acquire conceptual knowledge about argumentation. In Experiment 1, we compared video to text examples, and in Experiment 2, we compared video to graphic novel examples. Overall, learning by self-explaining examples was highly effective—regardless of the examples' presentation mode. We observed similar learning processes (i.e., invested mental effort and self-explanation quality), and the effect on learning outcomes (i.e., conceptual knowledge about argumentative principles) was large. However, learning by self-explaining texts or graphic novels came with a considerable time advantage and thus was more efficient than learning by self-explaining video examples. Finally, graphic novels might have the edge over text due to their higher rated authenticity.

Session R 4

16 August 2019 08:30 - 10:00

Seminar Room - S13

Single Paper

Higher Education

Doctoral and Researcher Education

Keywords: Assessment methods and tools, Content analysis, Developmental processes, Doctoral education, Higher education, Quantitative methods, Researcher education, Survey Research

Interest group: SIG 04 - Higher Education, SIG 24 - Researcher Education and Careers

Chairperson: Frans Andersen, Aarhus University, Denmark

PhD students' mental health and how mental health problems affect their success

Keywords: Doctoral education, Quantitative methods, Researcher education, Survey Research

Presenting Author: Els van Rooij, University of Groningen, Netherlands; **Co-Author:** Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:** Ellen Jansen, University of Groningen, Netherlands

Some alarming research findings revealed that many PhD students are suffering from mental health problems. Research on this issue is still scarce, but for universities to take measures to prevent or decrease young researchers' mental health problems more insight is needed. This study focuses on (1) the prevalence of mental health problems; (2) how mental health problems are related to PhD students' background characteristics; and (3) how mental health influences students' progress, intention to quit, and satisfaction. A survey was set out among more than 1,000 PhD students in the Netherlands that focused on general mental health, aspects of burnout, and work-life balance and work-life conflict. The results showed that 42% of the sample were at risk of serious mental health problems and that PhD students' scores on exhaustion, cynicism, and work-life conflict were higher than those in the general population, whereas their scores on efficacy and work-life balance were lower. Female PhD students, South American PhD students, PhD students whose contract ended but who still had to finish their thesis, and PhD students in the last years of their project (compared to those in the first two years) were more likely to have mental health problems. Multiple regression analyses revealed that burnout symptoms made the highest contributions to explaining PhD students' progress, intention to quit, and satisfaction. Our findings corroborate the results of earlier studies and emphasise the necessity for universities to take group-specific measures to increase PhD students' mental health.

A latent profile analysis of PhD supervision styles and types of support

Keywords: Doctoral education, Quantitative methods, Researcher education, Survey Research

Presenting Author: Els van Rooij, University of Groningen, Netherlands; **Co-Author:** Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:** Ellen Jansen, University of Groningen, Netherlands

High quality PhD supervision is of utmost importance to prevent dropout and delay in doctoral education. However, there have barely been quantitative studies that investigate PhD supervision and what types of supervision are associated with success. In this study, we aimed to distinguish PhD supervisors according to the type of supervision they provide and investigated how specific types of supervision were related to supervisors' background characteristics, characteristics of the supervision context, outcomes (timely completion and dropout), and supervisor experiences (e.g., workload). A latent profile analysis on survey data of 460 PhD supervisors in the Netherlands identified four PhD supervisor profiles, derived from three supervisory styles – supportive, structured, and flexible – and three types of support – academic support, personal support, and autonomy support. Supervisors with high scores on all styles and support types (10%) were the most successful in terms of timely completion of their PhD students, had the highest supervision self-efficacy and were most satisfied with their PhD students' work. They did, however, also indicate the highest supervision workload. Supervisors with higher scores on the structured than the supportive style (5%) and those who scored slightly below the mean on all factors (27%) scored significantly lower than the overall-high-supervisors and supportive-flexible supervisors (58%) on workload, work pleasure, satisfaction, availability, self-efficacy, and having a good relationship with all their PhD students. As the supervisors' profiles were related to important outcomes, the factors that formed the profiles can be used in supervision workshops or training and to monitor and (self-)evaluate PhD supervision.

Key considerations in interpreting PhD examiner feedback

Keywords: Assessment methods and tools, Content analysis, Doctoral education, Higher education

Presenting Author: Allyson Holbrook, The University of Newcastle, Australia; **Co-Author:** Kerry Dally, SORTI, The University of Newcastle., Australia; **Co-**

Author:Mitch OToole, SORTI, The University of Newcastle, Australia; **Co-Author:**Sue Starfield, Education, University of New South Wales, Australia; **Co-Author:**Hedy Fairbairn, SORTI, The University of Newcastle, Australia; **Co-Author:**Terence Lovat, University of Newcastle, Australia

In the field of doctoral examination and assessment, research directed to the role and impact of feedback is rare. This is not altogether surprising considering how little is known about the end stage of candidature and the further work that many candidates need to do to achieve acceptable level. This paper draws together new findings about the language and focus of formative comment and the level of complexity of that comment. Findings are discussed in light of the roles that feedback is known to play in assisting candidate learning, and the challenges that arise for the reader in interpreting feedback.

Career insecurity and self-management during PhD training: A longitudinal study

Keywords: Developmental processes, Doctoral education, Higher education, Quantitative methods

Presenting Author:Aida Alisic, RWTH Aachen University, Germany; **Co-Author:**Christian L. Burk, RWTH Aachen University, Germany; **Co-Author:**Bettina S. Wiese, RWTH Aachen University, Germany

Successfully dealing with career insecurity is a central developmental demand for PhD students. Building on the social cognitive theory of self-regulation (SCT; Bandura, 1991) and the conservation of resources theory (COR; Hobfoll, 1989), the present study investigates the longitudinal relationship between self-management and perceived career insecurity. We collected questionnaire data (online survey) at six measurement points (with six months intervals) from a sample of 2,163 PhD students from the STEM-fields, and used random intercept cross-lagged panel modeling (RI-CLPM; Hamaker, Kuiper, & Grasman, 2015) for data analysis. At the between-person level, self-management and career insecurity were negatively correlated. At the within-person level, results showed negative cross-lagged effects from self-management to career insecurity as well as negative cross-lagged effects from career insecurity to self-management. Results are in line with the idea of gain and loss spirals that are central to SCT and COR theory.

Session R 5

16 August 2019 08:30 - 10:00

Seminar Room - S06

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Cognitive skills, Doctoral education, Higher education, Problem solving, Psychometrics, Qualitative methods, Quantitative methods, Secondary data analysis, Survey Research

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Caj Niclas Sandström, University of Helsinki, Finland

The Impact of Learning Strategies on Problem-solving Performance: A Cross-national Comparison Study

Keywords: Assessment methods and tools, Cognitive skills, Problem solving, Quantitative methods

Presenting Author:Hao Wu, University of Szeged, Hungary; **Co-Author:**Gyongyver Molnar, University of Szeged, Hungary

The developments of the past decades have re-launched conception of the knowledge and skills students are expected to master at school in order to prepare them for an unknown future. Dynamic problem-solving is such a skill, as tasks that assess it involve knowledge acquisition and knowledge application as well. The purpose of the study is twofold: (1) to monitor the influence of parents' educational level on students' learning strategies in European and Asian contexts, and (2) to detect and compare the predictive power of students' learning strategies on their problem-solving performance in two different cultures. The sample for this study comprised 12-year-old students from China (N=187) and Hungary (N=835). Dynamic problemsolving was measured using a set of nine tasks developed in accordance with the MicroDYN approach. Three learning strategies (elaboration, memorization, and control strategies) were distinguished and measured using a self-report questionnaire adapted from the PISA 2000 assessment. The tests were reliable (Cronbach alpha: CN: .90, HU: .84). Chinese students preferred the use of control strategies in their learning activities, while memorization was the strategy most frequently applied by the Hungarian students. A structural equation modeling analysis indicated that parents' educational level had a negative predictive effect on the use of memorization learning strategies in the group from China but a positive predicting effect for students from Hungary. Meanwhile, all three learning strategies significantly predicted students' problem-solving performance in China, but only memorization strategies had an impact on students' problem-solving performance in Hungary.

Assessment practices for tomorrow doctoral programs: a systematic review of empirical researches

Keywords: Assessment methods and tools, Doctoral education, Higher education, Secondary data analysis

Presenting Author:Liliana Silva, University of Bologna, Italy; **Co-Author:**Massimo Marcuccio, Department of Education Studies "Giovanni Maria Bertin" - Alma Mater Studiorum - University of Bologna, Italy

Starting from a broader theoretical framework rooted into the balanced assessment system (National Research Council, 2001; Stiggins, 2008) and into the definition of *assessment practices* (Ax & Ponte, 2007; Laveault & Allal, 2016), this systematic review presents a qualitative synthesis of empirical research on assessment practices of students' learning during the PhD program, focusing on the anglophone context. Multiple aggregators and databases (ProQuest, Scopus, Web of Science, EBSCO) were interrogated and 11,829 contributions were extracted. After the selection of 724 contributions by the two authors, following to shared inclusion/exclusion criteria, 77 of these were then subject of critical evaluation towards the final definition of the 63 contributions included in the analysis. The analysis of the selected literature on the basis of contextual and methodological criteria allowed to elaborate a first mapping. The subsequent thematic analysis of the research objects highlighted the prevailing interest in two areas of investigation: a) the training assessment processes and the use of feedback by mentors and supervisors; b) the adoption of new tools and procedures for the learning assessment of the PhD students in the final exam. Conversely, a smaller number of papers investigate the pipeline and the assessment of transversal skills. The belief systems of students and teachers about the assessment of doctoral student learning seems to be an area that deserves a more systematic exploration. Therefore, the study of entrenched and current practices could be the foundations in order to identify possible future paths of development of the system of assessment practices in doctoral programs.

Adaptation of Culture in the Civic Online Reasoning Assessment Using Explicit Functional Equivalence

Keywords: Assessment methods and tools, Psychometrics, Qualitative methods, Survey Research

Presenting Author:Dimitri Molerov, Humboldt-University Berlin, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Susanne Schmidt, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Marie-Theres Nagel, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Jana Jurisch, Johannes Gutenberg-Universität Mainz, Germany

Critical thinking and analytic reasoning are among the most important student skills for the 21st century (NRC 2012), however, available assessments including for higher education are still scarce (e.g., Davey 2015). The Civic Online Reasoning Assessment (CORA) was developed and validated comprehensively for the U.S. (Wineburg & McGrew 2016, Wineburg et al. 2018). Our aim was to adapt the assessment (following the Test Adaptation Guidelines, ITC 2017) and subsequently validate it (according to psychometric standards, AERA et al. 2014) for higher education in Germany and potential cross-national use. To enable adaptation of the culturally specific items, which constitute important aspects of the operationalization, we followed the established best practice approach (TRAPD, Harness 2003) and in addition used a new method of explicit functional equivalence, derived from practice and translation theory (Braun 2006, Nord 2018). Results from qualitative pretest, including expert interviews (N=4) and observations of university students (N=11) during responding and subsequent interviews indicated that the adapted items are generally aligned with the measured construct and its most important components. The explicit functional equivalence approach provided a systematic means to develop and share a common understanding of the test function as a basis for adaptation. The method elicited important specifications of the test construct at the sub-item level, while the purposes of in-country use and cross-national comparability were observed. Experts pointed out slight deviations in solution paths and distractors for revision and further examination in in-depth analyses of translation-induced measurement error (Solano-Flores et al. 2009).

Students' Attitudes Towards Modes of Evaluation

Keywords: Achievement, Assessment methods and tools, Attitudes and beliefs, Higher education

Presenting Author: Mordechai Miron, Tel Aviv University, Israel

The purpose of the study was to determine the attitudes of Israeli students towards different modes of evaluation. The sample consisted of 346 undergraduate students who were enrolled in different faculties. The instrument used in the study was a questionnaire which aimed to establish students' preferences for three different modes of evaluation: The data revealed that essay tests were the most common mode of evaluation while objective tests were the least frequent. The students favoured the three types of evaluation, papers scored the highest, objective tests were less preferred and essay tests scored the lowest. The analysis of the data indicated that there were significant differences among students' attitudes from different faculties towards each mode of evaluation.

Session R 6

16 August 2019 08:30 - 10:00

Lecture Hall - H08

Single Paper

Cognitive Science, Higher Education

Case Studies and Integrated Learning in Higher Education

Keywords: Case studies, Cognitive skills, Engineering, Higher education, Integrated learning, Interdisciplinary, Learning Technologies, Social aspects of learning and teaching, Student learning

Interest group: SIG 04 - Higher Education

Chairperson: Allison Littlejohn, Open University, United Kingdom

Interdisciplinary study programs: The importance of program incorporation for study success

Keywords: Higher education, Integrated learning, Interdisciplinary, Social aspects of learning and teaching

Presenting Author: Anna M. Claus, RWTH Aachen University, Germany; **Co-Author:** Bettina S. Wiese, RWTH Aachen University, Germany

Students enroll in interdisciplinary study programs to understand and compare different approaches and perspectives, but also with the desire to work on societal, technological or environmental problems that cross disciplinary borders. In the past decades, the number of interdisciplinary study programs has increased. The integration of two or more disciplines sets interdisciplinarity apart from cross- or multidisciplinary approaches. Taking a closer look at interdisciplinary study programs the question arises whether all programs keep this integrative promise. Students expect to be educated interdisciplinarily and thus the program to incorporate different disciplinary perspectives. Lack of program incorporation and synthesis might lead to low study satisfaction and higher dropout intention. Due to the design of many programs, students might be confronted with additional challenges in terms of integration into their peer group and contact with faculty members. We hypothesize that social and academic integration mediate the effect of perceived study program incorporation on subjective study outcomes. In a sample of $N = 306$ students of interdisciplinary study programs, we found the hypothesized association of perceived study program incorporation with study satisfaction and dropout intentions as well as a partial mediation of that effect by social and academic integration. The results indicate that perceived program incorporation is highly relevant for the study success of interdisciplinary students. Furthermore, integration in the peer group as well as good contact with faculty members seems to buffer potential negative effects of lacking program incorporation.

A Quantitative and Qualitative Assessment of Students' Development in One Interdisciplinary Course

Keywords: Case studies, Higher education, Interdisciplinary, Student learning

Presenting Author: Merel van Goch, Utrecht University, Netherlands

Students require many different skills to innovatively tackle society's complex problems. How can higher education institutions foster these skills? Interdisciplinary education is said to foster this kind of innovative development. This research aims to: 1) create solid measurement methods to track students' development across academic disciplines, 2) map students' development throughout (inter)disciplinary undergraduate education, and 3) identify program characteristics that foster critical aspects of innovative development. It involved 150 Liberal Arts and Sciences students taking a course in which they learned the interdisciplinary research process. They were assessed qualitatively and quantitatively in the first and in the last lecture of the 10-week course, with respect to risk taking, alternative perspectives, innovative thinking, taking initiative, connective thinking, and curiosity. Results, suggestions for future research, and theoretical as well as educational implications will be discussed.

Acquisition of Hardware Reverse Engineering Competency in IT Security – An Explorative Field Study

Keywords: Case studies, Cognitive skills, Engineering, Learning Technologies

Presenting Author: Carina Wiesen, Ruhr-Universität Bochum, Germany; **Co-Author:** Steffen Becker, Ruhr-Universität Bochum, Germany; **Co-Author:** Christof Paar, Ruhr-Universität Bochum, Germany; **Co-Author:** Nikol Rummel, Ruhr University Bochum, Germany

In a world in which interconnected digital systems permeate almost all facets of our lives, IT security attacks form devastating threats with catastrophic consequences. Underlying hardware components are the basis of trust in every computing system and often the target of cyberattacks. To detect malicious manipulations in hardware, cyber security engineers commonly employ Hardware Reverse Engineering (HRE). HRE is described as the process of retrieving information from anything man-made, to understand its inner structure and workings. Even though industry and scientific communities have a high demand for engineers with HRE competencies little is known about the development of HRE competency. In our study we thus investigated how novice IT security students learned to solve HRE tasks and thus how they gained HRE competencies over a period of a few weeks. We analysed how efficient students solved the HRE tasks, how they handled difficulties and what role cognitive factors played. Our results reveal that even within a short period of time novices can acquire HRE competencies allowing them to solve HRE tasks and problems more efficient. Our results draw implications for future studies to receive a deeper understanding about how engineers acquire HRE for developing educational programmes in HRE.

Session R 7

16 August 2019 08:30 - 10:00

Seminar Room - S12

Single Paper

Assessment and Evaluation, Learning and Social Interaction, Motivational, Social and Affective Processes

Social Aspects of Learning and Teaching

Keywords: Achievement, Assessment methods and tools, At-risk students, Cooperative/collaborative learning, Early childhood education, Educational Psychology, Peer interaction, Primary education, Social aspects of learning and teaching, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Andreas Rausch, University of Mannheim, Germany

The relation between sick leave, staff stability, turnover and quality in Norwegian ECEC provisions

Keywords: Assessment methods and tools, Early childhood education, Social aspects of learning and teaching, Teacher Effectiveness

Presenting Author: Thomas Moser, Universitetet i Sørøst-Norge, Norway; **Co-Author:** Rasmus Kleppe, Oslo Metropolitan University, Norway; **Co-Author:** Erik Eliassen, Oslo Metropolitan University, Norway; **Co-Author:** Elisabeth Bjørnstad, Oslo Metropolitan University, Norway

Staff stability (and instability) is commonly thought to be an important pre-requisite for quality in early childhood education and care. We therefore tested whether ECEC centers with higher rates of sick leave, higher turnover, less frequent use of substitute staff, were associated with lower ECEC quality – as measured by

the Infant/Toddler environment rating scale. Furthermore, we also tested whether factors such as gender, staff age, child-to-staff ratios in turn predicted higher rates of sick leave. The sample included quality scores from 206 classrooms (from 94 centers), and aggregated data from 1894 staff members of which 622 are preschool teachers educated on a bachelor level. The preliminary results indicate that sickness rates above of 11% is associated with lower ECEC quality. Subsequently, we also found that a higher proportion of young teachers seems to predict lower ECEC quality, while we did not find a significant relations between quality and gender and child-to-staff ratio.

Psychosocial factors of victimization and bullying: individual and classroom characteristics

Keywords: At-risk students, Educational Psychology, Peer interaction, Social aspects of learning and teaching

Presenting Author:Katja Košir, University of Maribor, Slovenia

Current conceptions of bullying consider victimization and bullying behavior as orthogonal dimensions (Menesini & Salmivalli, 2017; Sanders & Pbye, 2004), whereas students can be high or low on both dimensions. However, studies that investigated predictors of victimization and bullying behavior in a single study are rare. The present study was designed to investigate contextual and individual predictors of self-reported and peer-reported victimization and bullying behavior on a large sample of Slovenian elementary school students in early adolescence. In addition, the psychosocial characteristics of four distinctive groups of bullying participants were investigated: bullies, victims, bully-victims, and uninvolved. 1,905 early adolescents participated in the study (49.9% boys). Students were nested in 135 classrooms within 22 elementary schools; 422 students were from sixth grade (46.7% boys), 482 from seventh grade (46.9% boys), 472 from eighth grade (52.8% boys), and 529 from ninth grade (52.4% boys). The mean age of participants was 12.8 years ($SD = 1.2$). Students' gender was found to be the most consistent predictor for both self- and peer-reported victimization and bullying. Other shared predictors of victimization and bullying were higher internalization and externalization of anger and perceived peer support for self-report measures and younger age, lower academic achievement, higher anger internalizing and externalizing, perceived teacher support, and fewer peer-reported friendships for peer-report measures. In addition, the same classroom characteristics – higher pro-bully classroom norms – represented a risk factor for both self-reported bullying and victimization. Significant differences in psychosocial characteristics of different bullying participants were found.

Teachers' judgments and halo effect: a new measure of halo and an analysis of certainty bias

Keywords: Achievement, Educational Psychology, Primary education, Social aspects of learning and teaching

Presenting Author:Camille Sanrey, Université Grenoble Alpes, France; **Co-Author:**Pascal Bressoux, Université Grenoble Alpes, France; **Co-Author:**Laurent Lima, Université Grenoble Alpes, France; **Co-Author:**Pascal Pansu, Université Grenoble Alpes, France

This research aimed to analyze the presence of a halo effect in teachers' judgments and to clarify the role of judgment certainty in this cognitive bias. The aim is twofold. On the one hand it aimed to propose a new way of highlighting the presence of a halo effect in judgments. On the other hand it allows us to analyze the effect of another variable on the presence of a halo effect. One study was undertaken to reach these two objectives. We analyzed the presence of a halo effect in teachers' judgments in first grade classes and extended this analysis by introducing the level of certainty as a potential predictor of the presence of a halo effect. The results confirmed that teachers' judgments are affected by a halo effect and that this effect is stronger when the certainty judgment is higher. It also confirmed the relevance of this new measure to analyze the presence of a halo effect and the effect of certainty on this halo effect. Theoretical and methodological consequences of this study will be discussed.

A multilevel analysis of classroom talk: Does collaborative instruction matter?

Keywords: Achievement, Cooperative/collaborative learning, Social aspects of learning and teaching, Teaching/instruction

Presenting Author:Melvin Chan, National Institute of Education, Singapore

The objective of the current study was to examine the extent to which different types of classroom talk impact student outcomes related to student outcomes, and how collaborative instruction may moderate these relationships. Specifically, we used a quantitative approach to operationalize key facets of classroom talk that broadly underlie Barnes' (2008) notions of presentational (i.e., performative and procedural) versus exploratory talk (i.e., clarifying, explaining and connecting). Using multilevel structural equation analyses, findings revealed consistent, but also disciplinary unique, patterns of specified associations that begin with presentational (performative and procedural) and leading on to exploratory forms of teacher questions across both mathematics and English classrooms. These findings, coupled with significant compositional (prior achievement) and contextual (collaborative instruction) effects, are consistent with a discussion-based recitation sequence and highlight the benefits of quantitatively analysed dialogue.

Session R 8

16 August 2019 08:30 - 10:00

Seminar Room - S09

Single Paper

Motivational, Social and Affective Processes

Self-Efficacy and Motivation and Emotion

Keywords: Emotion and affect, Higher education, Motivation, Quantitative methods, Science education, Self-efficacy, Self-regulation, Social interaction, Survey Research

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Stephanie Pieschl, Technical University of Darmstadt, Germany

A multi-level investigation of teacher-student relationships, self-efficacy, and outcomes in science

Keywords: Quantitative methods, Science education, Self-efficacy, Social interaction

Presenting Author:Emma Burns, University of New South Wales, Australia; **Co-Author:**Andrew Martin, University of New South Wales, Australia; **Co-Author:**Rebecca Collie, University of New South Wales, Australia

Self-efficacy is a key antecedent of engagement and achievement in science. Given that science outcomes have been declining over the past decade among Australian high-school students, there may be yields in understanding how to promote science self-efficacy. Social cognitive theory (SCT) signals that teacher-student relationships (TSRs) impact students' self-efficacy and that TSRs and self-efficacy form a motivational process that impacts academic outcomes. However, most work that has examined the effects of TSRs on students' science self-efficacy has been unidimensional and focused on the effects of positive TSRs, and little work has examined TSRs and self-efficacy as part of the larger motivational process outlined by SCT. Thus, the present investigation examines the extent to which the three dimensions of TSRs in science (socio-emotional support, instrumental help, conflict) predict students' science self-efficacy and, in turn, whether science self-efficacy predicts science engagement and achievement. Employing multi-level structural equation modelling, this investigation examined the Australian 2015 PISA sample. The sample comprises $N=14,530$ students ($M_{age}=15.77$ [$SD=0.29$]; 49% female) from $N=758$ schools. At the student-level, science teacher socio-emotional support and instrumental help positively predicted students' science self-efficacy, conflict negatively predicted self-efficacy, and self-efficacy positively predicted science engagement and achievement. At the school-level, school-average socio-emotional support positively predicted school-average self-efficacy and school-average self-efficacy positively predicted school-average engagement and achievement. Taken together, these findings indicate the importance of TSRs in science self-efficacy development and the impact of self-efficacy on science outcomes.

An Investigation of Achievement Emotions, Self-Efficacy, and Learning Strategy Use in Mathematics

Keywords: Emotion and affect, Quantitative methods, Self-efficacy, Self-regulation

Presenting Author:Yesim Capa Aydin, Middle East Technical University, Turkey; **Co-Author:**Basak Calik, Istanbul Medeniyet University, Turkey

The purpose of the study was to investigate the relationship among middle students' achievement emotions, self-efficacy and learning strategy use in mathematics. Having employed correlational research design and cluster sampling strategy, data were collected from 1113 sixth, seventh, and eighth-grade students. Data collection instruments were Achievement Emotions Questionnaire-Mathematics, Mathematics Skills Self-Efficacy Scale, Self-Efficacy Scale for

Self-Regulated Learning and the Learning Strategies section of Motivated Strategies for Learning Questionnaire. Canonical correlation results revealed that students with higher levels of positive and lower levels of negative emotions tended to express higher levels of mathematics skills self-efficacy and self-efficacy for self-regulated learning and displayed greater use of self-regulated learning strategies regardless of grade levels.

Teacher self-efficacy and collective teacher efficacy: Relations with school context and engagement

Keywords: Motivation, Quantitative methods, Self-efficacy, Survey Research

Presenting Author:Einar Skaalvik, Norwegian University of Science and Technology, Norway; **Co-Author:**Sidsel Skaalvik, NTNU - Norwegian University of Science and Technology, Norway

The purpose of this study was to explore how collective teacher efficacy and teacher self-efficacy were related to teachers' perceptions of job resources and demands in the working environment at school, teachers feeling of belonging and teacher engagement. Participants were 760 teachers in Norwegian primary school and middle school. Data were analyzed by means of confirmatory factor analysis and SEM analyses. Collective efficacy and teacher self-efficacy were moderately correlated. Collective efficacy mediated the association between job resources and teacher self-efficacy and teacher self-efficacy mediated the association between collective efficacy and teacher engagement. Also, the association between job resources and engagement were partly mediated through teachers' feeling of belonging.

Is it still worth it? Predicting temporal change in dropout intention by change in study motivation

Keywords: Higher education, Motivation, Quantitative methods, Self-efficacy

Presenting Author:Theresa Schnettler, University of Bielefeld, Germany; **Co-Author:**Julia Bobe, University of Bielefeld, Germany; **Co-Author:**Anne Scheunemann, University of Bielefeld, Germany; **Co-Author:**Stefan Fries, University of Bielefeld, Germany; **Co-Author:**Carola Grunschel, Westfälische Wilhelms-Universität Münster, Germany

Dropping out of university is a frequent phenomenon. Students' motivation is among the most important predictors of study dropout. Further, it explains study dropout beyond measures of prior school achievement. At the same time, it lacks longitudinal research, which addresses the multidimensional character of study motivation. In the present study, we took the perspective of an expectancy-value-cost approach in order to analyze the motivational reasons of an upcoming intention to drop out of studies while controlling for prior school achievement. We expand existing research by taking both, the initial level and longitudinal changes of study motivation as predictors of dropout intention and its longitudinal changes into account. A total of 326 undergraduate students of law and mathematics participated in a longitudinal study with three measurement points (from the beginning of the semester to the exam period). We modeled all data using latent change score models. The initial level of dropout intention was best explained by the initial values of study value and study cost beyond prior school achievement. Controlling for the initial levels of study motivation and prior school achievement, latent change score models revealed that the increase of dropout intention was largely explained by a latent decline in value and a latent growth in cost over time. Our results stress the crucial role of study value and cost but not academic self-efficacy as motivational predictors of the development of dropout intention. This should be taken into account for the work of student counsellors.

Session R 9

16 August 2019 08:30 - 10:00

Seminar Room - S01

Single Paper

Instructional Design, Learning and Social Interaction, Teaching and Teacher Education

Problem Solving in Mathematics

Keywords: Comprehension of text and graphics, Conceptual change, Experimental studies, Mathematics, Mixed-method research, Problem solving, Reading comprehension, Social interaction, Student learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 11 - Teaching and Teacher Education, SIG 27 - Online Measures of Learning Processes

Chairperson: Monica Gonzalez-Marquez, RWTH Aachen University, Germany

Joint attention at teacher gestures during problem solving scaffolding interaction

Keywords: Mathematics, Mixed-method research, Problem solving, Social interaction

Presenting Author:Markku Hannula, University of Helsinki, Finland; **Co-Author:**Eeva Haataja, University of Helsinki, Finland; **Co-Author:**Anniina Koskinen-Salmia, University of Helsinki, Finland; **Co-Author:**Miika Toivanen, University of Helsinki, Finland

The role of sufficient teacher gestures as a part of teaching interaction is considered to be essential. Nevertheless, research on classroom interaction lacks accurate empirical evidence on student visual attention during teacher gestures. This case study represents our first steps to explore this issue in the context of collaborative mathematical problem solving. To study gestures during interaction in detail, we have used five gaze-tracking glasses to record the gaze behavior of four Finnish 9th grade students and their teacher. We analyze the gaze behaviour during a collaborative mathematics problem-solving lesson. Our analysis showed that the students' visual attention was influenced by the type of teacher gestures. The students did not pay attention to teacher's beat gestures. During pointing gestures at the solution papers, the level of joint attention seemed to be the highest. Representational gestures, however, appeared to include dynamic mathematical contents, which was more difficult for the students to notice than the explicit pointing gestures. To conclude, combining video recording of teacher gestures and scaffolding interaction with momentary gaze coding provides us with a proper tool to chart the relations between these important aspects of beneficial teacher-student scaffolding interaction.

Components and levels of mathematical modelling in lower secondary education.

Keywords: Comprehension of text and graphics, Mathematics, Problem solving, Reading comprehension

Presenting Author:Sevinç Göksen-Zayim, University of Amsterdam, Netherlands; **Co-Author:**Derk Pik, University of Amsterdam, Netherlands; **Co-Author:**Rijkje Dekker, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

Mathematical modelling is a part of mathematical thinking. Phenomena from the real world are transformed and idealized into mathematics, to be analyzed, and to provide information. The ability to translate a problem back and forth between the real world and its mathematical representation also depends on the language proficiency of learners. Language skills are important in the conceptualizing and interpreting phases, and, in a different way in the phase of mathematization. This study will answer the following research questions: *Which components and levels of mathematical modelling are feasible and usable in the lower secondary education? What is the role of the context in modelling tasks?* Two mathematical modelling assignments were developed in three levels of difficulty for learners from 11 up to 15 years. Each individual task exists of two parts. The first part is a modelling assignment in a rich context and the second assignment is a mathematical core assignment, focusing on the mathematical content without context. With this setting we distinguish between pure mathematical problems and context-rich problems. The tests are completed by 248 learners, evenly divided over grade six, eight and ten. 26 learners participated in a task-based interview. The interviews showed that understanding context and language in general are important obstacles for the first level, albeit not the only one. The outcome of the task-based interviews together with an analysis of the assignment allow for discerning feasible levels for various aspects of the different modelling phases.

Micro Productive Failure Occasions in Mathematics Learning

Keywords: Conceptual change, Experimental studies, Mathematics, Problem solving

Presenting Author:Esther Ziegler, ETH Zurich, Switzerland

In the context of conceptual problem-solving material, productive failure has shown good effects on conceptual and transfer measures but not on procedural measures. It is not clear whether these effects of productive failure on learning would be consistent in the context of manipulation problem-solving material.

Demanding manipulation material usually consists of several types of principles to be introduced and distinguished from each other. Therefore in our study of introducing algebraic expression simplification over three instruction sessions, short productive failure interventions were presented always before a new principle was presented. A total of 85 sixth-graders were assigned to either an experimental condition of productive failure or a control condition of additional practice. The results revealed an outperformance of offering minimal productive failure occasions compared to offering additional practice on the procedural measure with isomorphic problems, that is, productive failure improved flexible simplification of algebraic expressions. However, the intervention did not show effects on the verbal conceptual and transfer measures. Surprisingly, just a minimal intervention impacted flexible manipulation skills on isomorphic material. Such a minimal intervention with productive failure occasions for to-be-introduced principles is easily applicable in all instructional settings.

Influence of the task representation on problem solving success of primary school children

Keywords: Comprehension of text and graphics, Mathematics, Problem solving, Student learning

Presenting Author: Nina Sturm, University of Education Ludwigsburg, Germany

Solving non-routine word problems is for many primary school students a challenge. A training program was therefore developed to help third-grade students to find solutions to word problems by construct external representations (e.g., sketches, tables) and to specifically use them. Our findings revealed that students who understood the facts described were able to generate and use representations. In addition, we found out that the association between usage of external representations and performance differs according to the level of text comprehension. The failure to succeed was often accompanied by a lack of understanding the word problem. Therefore, the main intention of the subsequent study is to find out if the use of easy-read-language as well as the use of symbols and photos help to increase the text comprehension and consequently the learning outcome. First results concerning the impact of the use of easy-to-read-language, symbols and photos on the learning outcome of students are presented in this talk.

Session R 10

16 August 2019 08:30 - 10:00

Lecture Hall - H06 - Amazon Hörsaal

Single Paper

Assessment and Evaluation, Learning and Social Interaction, Lifelong Learning

Educational Psychology

Keywords: Assessment methods and tools, Attitudes and beliefs, Cognitive skills, Educational Psychology, Emotion and affect, Higher education, History, Meta-analysis, Metacognition, Peer interaction, Primary education, Reading comprehension, Social interaction

Interest group: SIG 01 - Assessment and Evaluation, SIG 10 - Social Interaction in Learning and Instruction, SIG 16 - Metacognition

Chairperson: Susan Yoon, University of Pennsylvania, United States

Immediate and delayed effects of a modelling example on the application of good feedback principles

Keywords: Assessment methods and tools, Educational Psychology, Higher education, Peer interaction

Presenting Author: Floris van Blankenstein, Leiden University Medical Center, Netherlands; **Co-Author:** Roeland M. Van der Rijst, ICLON-Leiden University Graduate School of Teaching, Netherlands; **Co-Author:** Nadira Saab, Leiden University, Netherlands

The learning benefits of peer feedback have been widely reported. However, it is still ill-understood which specific learning activities contribute to the acquisition of feedback skills. This study aimed to compare the effect of a modelling example, i.e., a model who demonstrated how to give feedback, on how students give feedback. 118 second-year bachelor students in pedagogical sciences were assigned randomly to a *practice condition*, in which they practiced giving feedback on a presenter in two videos, or a *observation condition*, in which a lecturer demonstrated how to give feedback on the same presenter in the same videos. Students then gave feedback to a new presenter in a new video (T1). One week later (T2), they gave each other peer feedback on presentations during a workgroup session. At T1, the observation condition gave more total feedback, referred more often to assessment criteria in their feedback and expressed more positive and negative judgments than in the practice condition. However, there was no difference in the amount of elaboration and feed-forward between the two conditions. At T2, there were no significant differences between the two conditions. The results suggest that, at least on the short term, a modeling example can stimulate the use of assessment criteria and judgments in feedback. The results and implications for future research and practice are discussed.

Meta-Analyses on Relative Metacomprehension Accuracy and Interventions to Improve it

Keywords: Educational Psychology, Meta-analysis, Metacognition, Reading comprehension

Presenting Author: Anja Prinz, University of Freiburg, Germany; **Co-Author:** Stefanie Golke, University of Freiburg, Germany; **Co-Author:** Joerg Wittwer, University of Freiburg, Germany

Learners' ability to discriminate between more and less well understood texts, that is, relative metacomprehension accuracy, is often poor. To improve it, several interventions have been investigated, such as the construction of concept maps, the delayed generation of summaries or keywords, self-explaining, and rereading. However, meta-analytic evidence on their effectiveness is missing. We conducted multiple meta-analyses, first, to explore how high relative metacomprehension accuracy is in baseline conditions without any manipulation and, second, to examine the effectiveness of different interventions to improve relative metacomprehension accuracy. The results supported that baseline relative metacomprehension accuracy is on average quite low. Moreover, the construction of concept maps during studying and the delayed generation of summaries are most effective in improving relative metacomprehension accuracy. Hence, although these tasks require some extra abilities and efforts on the side of the learners, the costs pay off by boosting their discrimination ability.

Engaging authenticity: A framework for encountering complex historical sources

Keywords: Cognitive skills, Educational Psychology, Emotion and affect, History

Presenting Author: Lisa Henke, University of Tübingen, Germany; **Presenting Author:** Allison Weller, Columbia University, United States; **Presenting Author:** Christine Baron, Teachers College, Columbia University, United States; **Co-Author:** Christiane Bertram, University of Konstanz, Germany

Complex historical sources, such as eyewitnesses of the past or historic sites, pose considerable challenges for researchers seeking to understand teaching and learning with and about those sources. This work offers a conceptual model of learning experiences with complex historical sources to help researchers better understand the interplay of learners' cognitive, affective, and physical responses to encounters with these complex historical sources. Drawn from empirical and theoretical literature in anthropology, psychology, and history/social studies education in English and German, this model offers a step towards a deeper understanding of the attendant pieces of this complex experience and how we can grasp it. The framework serves for empirical researchers and practitioners to understand the underlying mechanisms of learning with complex sources in order build a pedagogy that empowers learners to become reflective citizens of our society.

Can pupils' self-evaluation biases influence teachers' judgments?

Keywords: Attitudes and beliefs, Educational Psychology, Primary education, Social interaction

Presenting Author: Anne-Laure de Place, Université Grenoble Alpes, France; **Co-Author:** Ludivine Jamain, Université Grenoble Alpes, France; **Co-Author:** Therese Bouffard, Université du Québec à Montréal, Canada; **Co-Author:** Pascal Pansu, Université Grenoble Alpes, France

This paper aims to clarify the determinants of teachers' judgment of their pupils' competence. While this judgment is strongly related to pupils' actual performance, the influence of other less objective factors such as the average achievement level of a class, pupils' scholastic history or their gender has also been highlighted (e.g., Dompnier, Pansu, & Bressoux, 2006). In this study, we assume that students' self-evaluations biases, whether they indicate an under- or an over-estimate of their academic competence, also affect their teacher's judgment. Five hundred-eight third graders completed standardized tests in French and mathematics as well as self-reported measures of competence in both disciplines, which allowed us to measure their self-evaluations biases. Teachers' judgment about each pupil in both disciplines was also collected. As expected, when controlling for the contextual and personal factors already identified in the literature, students' self-evaluation biases in French and mathematics positively impacted teacher's judgment in both disciplines: the more positively biased the

students were, the higher their teacher estimated their academic competence to be. In other words, all else being equal, pupils who overestimated their capacities were perceived as more competent than pupils who underestimated them. Implications of these findings for students' motivation and school adaptation will be discussed.

Session R 11

16 August 2019 08:30 - 10:00

Lecture Hall - H05

Single Paper

Assessment and Evaluation, Teaching and Teacher Education

Teaching and Instruction

Keywords: Achievement, At-risk students, Educational Psychology, Experimental studies, Mathematics, Model-based reasoning, Out-of-school learning, Reading comprehension, Science education, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Attila Pásztor, MTA-SZTE Research Group on the Development of Competencies, Hungary

Validation of a model of place value concepts

Keywords: Achievement, Mathematics, Model-based reasoning, Teaching/instruction

Presenting Author: Moritz Herzog, University of Duisburg-Essen, Germany; **Co-Author:** Annemarie Fritz-Stratmann, University of Duisburg-Essen, Germany

A resilient understanding of the decimal place value system is a crucial part of primary school mathematics (Herzog et al., in press; Reiss et al., in press). As a consequence, children who lack a profound place value understanding often have math difficulties (e.g. Gervasoni & Sullivan, 2007). Therefore we investigated if a hierarchical structure in the development of place value concepts can be identified. In our talk we present a theoretically grounded four-level model of place value concepts and its empirical validation (Fuson et al., 1997; Herzog et al., in press; Ross, 1989). Regarding the validity of the model, we raise two central questions: (a) Do the item difficulties in a Rasch analysis display the hierarchical structure of the model? (b) How are place value concepts distributed across children of different grades? In a study with $N=818$ learners from grades 3 through 5 from a West-German metropolitan area and its surrounding place value concepts were assessed with a corresponding test according to the model. In a common Rasch analysis items aligned as predicted by the model and formed consistent levels of difficulty. The distribution of concepts across different grades reveals that learners in higher grades more often have elaborated concepts while lower place value concepts are widespread across learners for lower grades. The presented model describes crucial learning steps which children encounter while establishing resilient place value concepts. It is thus appropriate to structure assessment and instruction in classrooms (Herzog et al., in press).

The Impact of Mindset-Priming on Student Teachers' Written and Oral Explanations in Mathematics

Keywords: Educational Psychology, Experimental studies, Mathematics, Teaching/instruction

Presenting Author: Matthias Nückles, University of Freiburg, Germany; **Co-Author:** Mona Weinhuber, University of Freiburg, Germany; **Co-Author:** Andreas Lachner, University of Tübingen, Germany

It is widely agreed that teachers' knowledge and beliefs influence teachers' core practices, such as providing explanations. However, teachers may unintentionally adopt situational mindsets that emerge from the social practice teachers and students co-construct. Such mindsets (i.e., cognitive orientations) may act as powerful determinants of teachers' actions. Two experiments supported this mindset-hypothesis. In Study 1, mathematics pre-service teachers ($N = 79$) were briefly presented either a comic depicting mathematics social practice as argumentation or a mathematics-neutral control comic. Pre-service primed with an argumentative comic wrote more principle-oriented and less procedure-oriented explanations than pre-service teachers primed with a mathematics-neutral comic. In Study 2 ($N = 48$), we successfully replicated these findings asking pre-service teachers to provide oral explanations. Evidently, the comic scenarios triggered specific mindsets that influenced pre-service teachers' readiness to include principled and omit procedural information in their explanations. Participants of both experiments were completely unaware of the comic's influence on their explanations. These results could stimulate teachers to critically reflect on their mathematics social practice in schools, given that principle-oriented explanations are generally more effective than procedure-oriented explanations in helping students gain transferable knowledge.

How science outreach contributes to students' science capital- Teachers' perspectives.

Keywords: At-risk students, Out-of-school learning, Science education, Teaching/instruction

Presenting Author: Roberts Zivtins, Imperial College London, United Kingdom; **Co-Author:** Tim Jay, Sheffield Hallam University, United Kingdom; **Co-Author:** Robert Winston, Imperial College London, United Kingdom

Despite efforts of outreach practitioners, the science sector is still stratified by race, gender and class. Most outreach research focusses on measuring outcomes of the beneficiaries (i.e. the students). This study takes a slightly different approach and asks the teachers who bring students to science outreach activities what *they* hope students will gain from the experience. Semi-structured interviews were conducted with eight visiting teachers and thematically analysed using science capital (Archer, *et al.* 2015) as the key theoretical lens. Findings indicate that teachers do not use outreach to develop their students' curricular knowledge and improve their stock of institutional capital (i.e. qualifications). Instead, teachers see science outreach as an opportunity to give students an authentic induction to the scientific community. This experience allows students to observe the unspoken rules and tacit social norms of the science community, as well as non-curricular knowledge, which can be disorientating or exclusionary to newcomers. Students can internalise these new concepts by 'diffuse education', developing their stock of *embodied* science capital. This paper stresses the importance of understanding the teachers' perspective for successful school/university outreach partnerships. In this context, the extra-curricular nature and authenticity of outreach are emphasised for their capacity to build embodied forms of science capital.

Associations between pace of letter instruction, teaching practices and children's literacy skills

Keywords: Achievement, Reading comprehension, Teaching approaches, Teaching/instruction

Presenting Author: Kristin Sunde, University of Stavanger, Norway; **Co-Author:** Kjersti Lundtre, University of Stavanger, Norway

(Study 2) A faster pace than the one letter a week approach has proven to be associated with better letter knowledge, word reading and spelling in first grade (Sunde, Furnes, & Lundtræ, submitted; Jones & Reutzel, 2012). To expand on these findings we investigated to what extent teachers in 51 first grade classrooms within 51 schools with different paces of letter instruction, reported time devoted to students' own writing, repetition of the letters and adapted reading materials, and whether there was an association between pace in letter instruction and the prevalence of the mentioned teaching practices. Further, we investigated whether the frequencies of these teaching practices were related to children's literacy skills at the end of first grade and if pace of letter instruction contributed over and beyond teaching practices. Teachers who introduced the letters at a faster pace provided children with more time to write, used levelled books to adapt reading material to individual children, and repeated the letters regularly. Time spent on students' own writing and repetition of the letters were positively associated with children's skills at the end of first grade. Finally, pace of letter instruction contributed significantly over and beyond teaching practices, even when controlling for students' skills at school start and teacher experience.

Session R 12

16 August 2019 08:30 - 10:00

Seminar Room - S10

Single Paper

Higher Education

Synergies between learning and teaching

Keywords: Communities of practice, Cooperative/collaborative learning, Cultural psychology, Higher education, Instructional design, Interdisciplinary, Mixed-method research, Qualitative methods, Synergies between learning teaching and research, Teacher professional development, Teaching approaches

Interest group: SIG 04 - Higher Education

Chairperson: Erkkö Sointu, University of Eastern Finland, Finland

Student involvement in the design of learning and teaching: Disentangling the terminology

Keywords: Cooperative/collaborative learning, Higher education, Instructional design, Synergies between learning teaching and research

Presenting Author: Samantha Martens, Maastricht University, Netherlands; **Co-Author:** Stephanie Meeuwissen, Maastricht University, Netherlands; **Co-Author:** Diana Dolmans, Maastricht University, Netherlands; **Co-Author:** Karen Könings, Maastricht University, Netherlands

Students are ever more involved in the design of educational practices, which is reflected in the growing body of literature about approaches to student involvement: design-based research (DBR), participatory design (PD), co-creation, co-design, student voice, student-staff partnership, students as change agents, student engagement, and student empowerment. Similarities and differences between these approaches often remain vague since the terms are used interchangeably. This confusing and fragmented body of literature hampers good understanding of student involvement and choosing the most suitable approach for it. Therefore, in Web of Science we identified the three mostly used terms related to the design of learning and teaching: DBR, PD, and co-creation. The terminology of different approaches was disentangled by focusing on relevant definitions, aims, involvement of stakeholders, outcomes, and related terminology. DBR is about collaboration of researchers, educational designers, and teachers to solve educational problems and advance theoretical understanding of instructional design. PD is a collaboration of stakeholders such as teachers, students, and educationalists to develop innovations for local purposes focusing on practical aspects such as usability. Co-creation is a close collaboration of teachers and students to intensify active engagement of students and improve teaching and learning by welcoming students' perspective, which goes beyond only listening to student voice. Taken together, differences between the approaches can be found in the level of putting students as central stakeholders and the focus on instructional theory building. For choosing the most suitable approach the level of student involvement needs to be aligned with the purpose of the approach.

An ecological framework for studying interdisciplinary learning: linking culture, activity and mind

Keywords: Cultural psychology, Higher education, Interdisciplinary, Synergies between learning teaching and research

Presenting Author: Lina Markauskaite, University of Sydney, Australia; **Presenting Author:** Monika Nerland, University of Oslo, Norway

Over the last decade there has been a substantial growth of interdisciplinary offerings in higher education, and so a rise of studies for investigating interdisciplinary teaching and learning. However, as the UK Higher Education Academy's report synthesizing recent research concludes, current interdisciplinary pedagogies are lacking the necessary theoretical underpinning and empirical studies have been highly undertheorised (Lyall, Meagher, Bandola, & Kettle, 2016). While educational researchers have reasonably mature theoretical and methodological frameworks for investigating teaching and learning within individual disciplines, these frameworks cannot be readily applied for interdisciplinary courses, where concepts, objects and knowledge practices from several disciplinary domains intersect and knowledge itself emerges. Interdisciplinarity requires moving beyond commonly adopted ways of defining and measuring learning quality against the established epistemological standard to finding new ways for assessing teaching and learning in knowledge domains where practices and standards are not settled. In this paper, we draw upon the epistemic practice perspective that has been developed for theorizing complex knowledge work in research and organizational settings (Knorr-Cetina, 2007) and introduce an integrated ecological framework for investigating interdisciplinary teaching and learning. Our proposed conceptualization brings into one coherent analytical framework socio-cultural, socio-material and socio-cognitive perspectives and sees interdisciplinary learning as a hybrid epistemic practice where students construct their understanding by fusing epistemic tools, ways of knowing, objects, and personal knowledge resources from diverse disciplines and trans-disciplinary fields. This view comes with a distributed notion of teaching quality that places emphasis on co-design of epistemic environments for interdisciplinary knowledge work and learning.

Team-based curriculum design in higher education: A qualitative study of design conversations

Keywords: Communities of practice, Higher education, Qualitative methods, Teacher professional development

Presenting Author: Inken Gast, Maastricht University, Netherlands; **Co-Author:** Jan Van der Veen, Twente University, Netherlands; **Co-Author:** Susan McKenney, University of Twente, Netherlands; **Co-Author:** Kim Schildkamp, University of Twente, Unknown

Collaborative curriculum design is getting greater attention in higher education as a way to support ongoing innovation. Universities, however, need to be aware of how faculty teams develop new educational units in order to support these teams. This study looks into the design process of two faculty teams, and focuses on the design topics and the specific design acts within the design conversations. Furthermore, the evolution of these topics and design acts over time is studied. Our findings show that most conversations involve the topics of pedagogical content knowledge, scheduling and the teamwork process, neglecting other topics. Moreover, a lack of cognitive demand is identified in the design conversations, especially towards the end of the teams' design cycle.

University teachers' and doctoral students' visual processing of teaching-learning situations

Keywords: Higher education, Mixed-method research, Teacher professional development, Teaching approaches

Presenting Author: Erkki Anto, University of Turku, Finland; **Co-Author:** Henna Vilppu, University of Turku, Finland; **Co-Author:** Mari Murtonen, University of Turku, Finland; **Co-Author:** Neea Heinonen, University of Turku, Finland

Professional vision, i.e. the ability to notice and interpret significant interactions in the classroom, is an important part of teachers' pedagogical expertise. At the university, teachers are assumed to pay attention to students' learning and approach their teaching in a learning focused manner. Pedagogical training has been documented to influence university teachers' in becoming more learning-focused in their thinking. Further, experience in teaching has been demonstrated to have an influence on how teachers process classroom information. In this study, we aim to explore how university teachers and doctoral students visually process information of teaching-learning situations, and whether pedagogical training or teaching experience has an influence on this. A total of 50 participants watched short video clips of teaching-learning situations twice. During the second watch, they were prompted to think aloud what they were thinking during the first watch. The videos were divided into areas of interest (AOIs), which in this study were the students, the teacher and the slides. The results show that participants who had previous pedagogical training, looked more the AOI of students than those who did not have any pedagogical training. Thus, it seems that the effects of pedagogical trainings can be seen on the level of teachers' gaze patterns. It is probable that the trained teachers were more sensitive to students' verbal and nonverbal actions during the teaching-learning situation. They paid attention to students and probably were capable of making interpretations of students' learning situations, which is a prerequisite for learning focused approach to teaching.

Session R 13

16 August 2019 08:30 - 10:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Single Paper

Assessment and Evaluation, Learning and Instructional Technology, Motivational, Social and Affective Processes

Technology-Enhanced Learning and Instruction

Keywords: Competencies, Computer-assisted learning, Computer-supported collaborative learning, Educational Psychology, Educational technology, Experimental studies, Informal learning, Motivation, Multimedia learning, Secondary data analysis, Secondary education, Self-efficacy, Technology

Interest group: SIG 01 - Assessment and Evaluation, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Piia Naykki, University of Oulu, Finland

Digital Home Learning Environment and its relationship to children's ICT self-efficacy

Keywords: Computer-assisted learning, Computer-supported collaborative learning, Informal learning, Self-efficacy

Presenting Author:Sabrina Bonanati, Paderborn University, Germany; **Co-Author:**Heike M. Buhl, Paderborn University, Germany

Self-efficacy is one important factor, which explains differences in the development of computer and information literacy (CIL). This study aimed at investigating associations between different qualities of digital home learning environment (HLE) and children's ICT self-efficacy. Moderation effects of gender also were tested. 651 fifth- and sixth-graders participated in the study. On the one hand, children completed a questionnaire addressing several different types of digital HLE. On the other hand they estimated their ICT self-efficacy by an adapted version of Schwarzer and Jerusalem's (1999) general self-efficacy scale. Results showed that different aspects of digital HLE could be separated. The interplay of passive and active digital HLE factors was observed. Especially families' cultural capital, parents' attitudes towards the internet, and shared internet activities at home showed a positive contribution to ICT self-efficacy. However, parents' instructions during children's ICT use were negatively associated with ICT self-efficacy. We observed small gender differences but the moderation effect was not significant.

Explorations of Adolescents' Socio-digital Participation, Networks and Excessive ICT Engagement

Keywords: Educational Psychology, Informal learning, Secondary education, Technology

Presenting Author:Milla Kruskopf, University of Helsinki, Finland; **Co-Author:**Kai Hakkarainen, University of Helsinki, Finland; **Co-Author:**Shupin Li, University of Turku, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland

The rise of modern socio-digital technologies has fundamentally changed the ways in which people communicate, cultivate interests and live their everyday lives in the new media ecology. This study sheds some light on South-Finnish adolescents socio-digital participation, networks and excessive ICT engagement based on a theme interview including egocentric network drawings and key event timelines. The interview participants (n=17) were recruited based on a previous study by Li et al. (2017) and were selected to represent their three profiles of socio-digital participation: the *basic participants* (n=5), the *creative participants* (n=8) and the *gaming-oriented participants* (n=3). During the interviews, the participants were requested to draw and reflect on their interest-related egocentric networks or key-events in their interest development. The interview results indicated clear, qualitative differences in the development of primary interests and the networks related to them. E.g. egocentric networks related to digitally oriented participation were denser and more widely distributed geographically and interest informality coincided with the classic, four-phase interest development. There was also a variety of experiences of the excessiveness of ICT use between the three interest profiles of socio-digital participation. These youth in general appeared to experience their ICT use as excessive to some degree. However, they criticized the concept "ICT addiction" referring to a comparatively normal amount of ICT engagement according to their standards. The results gave insight into the personal significance of socio-digital participation in the lives of modern adolescents, which may help in developing and tailoring future educational arrangements and solutions.

Relationship between early computer use and ICT competence: Evidence from OECD Countries

Keywords: Competencies, Educational technology, Secondary data analysis, Technology

Presenting Author:Libor Juhaňák, Masaryk University, Czech Republic; **Co-Author:**Jiří Zounek, Masaryk University, Czech Republic; **Co-Author:**Klára Záleská, Masaryk University, Czech Republic; **Co-Author:**Ondřej Bárta, Masaryk University, Czech Republic

As information and communication technologies (ICT) have been getting continuous attention in educational area for decades now. The development of ICT competence and autonomy in using ICT in pupils proves to be a worthwhile area of educational research. This contribution deals with a potential relationship between the early use of computer and ICT competence and autonomy in pupils. This relationship is examined on data from the PISA 2015 survey, which also contained an ICT related module (questionnaire) across OECD countries, which participated in this survey. First analyses bring promising results, preliminary confirmation of the relationship between the early use of computer and pupils' ICT competence and autonomy, as well as interesting indications for more complex developmental processes connected to ICT competence and autonomy. Implications for further research as well as educational policy area are discussed.

How choice options can help to improve learning with digital media by an increase of autonomy

Keywords: Computer-assisted learning, Experimental studies, Motivation, Multimedia learning

Presenting Author:Sascha Schneider, Chemnitz University of Technology, Germany; **Co-Author:**Steve Nebel, Chemnitz University of Technology, Germany; **Co-Author:**Maik Beege, Chemnitz University of Technology, Germany; **Co-Author:**Günter Daniel Rey, Chemnitz University of Technology, Germany

The motivation for students to keep working with online materials can fade quite rapidly. Reasons for it might lay in the limited perceived autonomy while reading and solving tasks on computers. Based on previous school setting experiments and the self-determination theory, a provision of choice might help to improve learners' perception of autonomy and intrinsic motivation. However, the questions if such a choice is applicable to online learning settings and if such a choice needs to be learning-relevant for students are still open. In two experiments ($N_1 = 79$, $N_2 = 87$) secondary school students were randomly assigned to either a group with a feigned topic choice options or a group without the possibility to choose, while the second experiment additionally examined the difference between learning-relevant (i.e., topic choice) and learning-irrelevant choice (i.e., background music choice). Results of both experiments show that the retention and transfer learning performance was enhanced by choice options in contrast to no choice. In addition, ratings of perceived autonomy, intrinsic motivation were significantly raised, while the external regulation decreased when students were able to choose. The effect of choice on retention was mediated by perceived autonomy, but not intrinsic motivation. Regarding the relevance of choice options, learning-irrelevant choices were not found to significantly impact scores of learning transfer and external regulation in the second experiment. These results support and concretize the mediational effects of choice in learning with digital media.

Session R 14

16 August 2019 08:30 - 10:00

Seminar Room - S04

Single Paper

Motivational, Social and Affective Processes

Students' Value Beliefs in STEM: Evidence from Childhood through Adolescence

Keywords: Educational Psychology, Mathematics, Motivation, Primary education, Quantitative methods, Secondary education, Self-efficacy, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Tim Surma, Open University of the Netherlands, Netherlands

Subjective task values and STEM aspirations across middle school

Keywords: Educational Psychology, Motivation, Quantitative methods, Secondary education

Presenting Author:Janica Vinni-Laakso, University of Helsinki, Finland; **Co-Author:**Jiesi Guo, Australian Catholic University, Australia; **Co-Author:**Jari Lavonen, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

The aim of the study is to examine the stability and change of students' subjective task values (STVs) across middle school, and to investigate if students' subject specific values and cost predict their educational and occupational STEM (Science, Technology, Engineering, and Mathematics) aspirations at the 9th grade. Data (N=1702) was collected from 22 lower secondary schools in Helsinki at three measurement occasions students being at 7th, 8th and 9th grade (age 14, 15 and 16 years, respectively). Participants filled in a self-report questionnaire that assessed their STVs (importance, utility, interest) and cost (effort, exhaustion) in Finnish, Mathematics, Biology, and Physics. We used traditional Cross-Lagged Panel Model (CLPM) to examine students' values and cost across subjects and grades with class level controlled. Gender and prior achievement in measured subjects was added in the model to predict students' STVs and future educational and occupational STEM aspirations. Overall, subject specific values and cost were rather stable across middle school, and higher achievement was mainly linked to higher value and lower cost in the same subject. Boys placed higher value in Physics, while girls placed higher value in

Finnish and Biology. Girls perceived more cost in Physics and Math across middle school. High value in Biology predicted future STEM aspirations, while high value in Finnish and lower achievement in Physics predicted future occupation to be in non-STEM field. Girls reported more occupational STEM aspirations compared to boys at the end of middle school.

Primary school students' value beliefs in mathematics: Factorial structure and gender differences

Keywords: Mathematics, Motivation, Primary education, Quantitative methods

Presenting Author: Iris Dinkelmann, Thurgau University of Teacher Education, Switzerland

Although in recent years, based on the Eccles et al. expectancy-value model, several studies have focused on secondary school and older students' value beliefs in mathematics, relatively little is known regarding the questions of which value facets younger students differentiate and whether gender differences exist. This contribution aims to clarify these questions on the basis of the framework presented by Trautwein and colleagues. Approximately 400 Swiss children attending grade four to six completed an adapted version of the questionnaire developed by Gaspard and colleagues in their class between March and May 2018. Confirmatory factor analyses were conducted separately for the four value components (intrinsic value, attainment value, utility value, and cost). Based on these models, an overall model including all components and facets was tested. Preliminary results suggested that the students differentiated eight facets of value beliefs. Although the overall model fit was good, in-depth model evaluation and further analyses based on modification indices are planned in order to obtain the final, potentially revised model. Based on that model, tests of measurement invariance and of invariance of latent means across gender will be performed. At the conference, the final model as well as the results on gender differences will be presented and results will be discussed.

Teachers' self-efficacy, student-perceived support and students' interest in math

Keywords: Motivation, Primary education, Self-efficacy, Teaching/instruction

Presenting Author: Elisa Oppermann, Freie Universität Berlin, Germany; **Co-Author:** Rebecca Lazarides, University of Potsdam, Germany

Previous studies have demonstrated the importance of teachers' self-efficacy for the quality of their instructional practices and student motivation. Yet, little is known about this relation at the primary school level. The present study examined the longitudinal effects of teachers' self-efficacy on student-perceived teacher support and students' interest in mathematics based on a sample of 2,082 students and their mathematics teachers (N = 133) in 3rd and 4th grade. Results of doubly-manifest multilevel regression analyses revealed that teachers' self-efficacy beliefs in grade 3 predicted student-perceived teacher support at the classroom level in grade 4, which – in turn – were positively related to students' interest in grade 4. There was no direct relation between teachers' self-efficacy beliefs in grade 3 and students' math interest in grade 4. The findings underline the relevance of (1) teachers' self-efficacy beliefs for student-perceived support and (2) the importance of student-perceived teacher support for the development of students' interest in mathematics in mid-primary school.

The transmission of motivation from teachers to students: Different mechanisms for different values?

Keywords: Motivation, Quantitative methods, Secondary education, Teaching/instruction

Presenting Author: Cora Parrisius, University of Tübingen, Germany; **Co-Author:** Hanna Gaspard, University of Tübingen, Germany; **Co-Author:** Heide Piesch, University of Tübingen, Germany; **Co-Author:** Eike Wille, University of Tübingen, Germany; **Co-Author:** Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:** Benjamin Nagengast, Eberhard Karls Universität Tübingen, Germany

Teachers' motivation has been shown to have a substantial impact on their students' motivation. We assume teachers to express their motivational beliefs through their classroom practices and consequently transmit their beliefs to their students who incorporate and express these beliefs themselves. To test this assumption, we used data from 70 math teachers and their 1,744 ninth grade students out of 79 classes from 28 German academic track schools. We estimated the impact of teachers' a) enthusiasm for teaching, b) enthusiasm for mathematics, and c) utility value regarding mathematics on their students' intrinsic and utility value. Cross-level mediation analyses showed that teachers' enthusiasm for teaching predicted changes in students' intrinsic value and that teachers' utility value predicted changes in students' utility value. These effects were partially mediated through student-perceived instructional practices.

Session R 15

16 August 2019 08:30 - 10:00

Lecture Hall - H11

Single Paper

Learning and Social Interaction, Lifelong Learning, Teaching and Teacher Education

Early Childhood Education

Keywords: Early childhood education, Emotion and affect, Language (Foreign and second), Lifelong learning, Literacy, Qualitative methods, Self-efficacy, Social interaction, Teacher professional development, Video analysis

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Rosanna Cofone, University of Roma Tre, Italy

What is important for children to have learned when starting school?

Keywords: Early childhood education, Lifelong learning, Literacy, Qualitative methods

Presenting Author: Liv Ingrid Aske Håberg, Volda University College, Norway

The aim of this study is to enlighten and discuss what staff in Norwegian kindergarten means is children's most important and necessary knowledge and competences by school start. In what degree early literacy skills and learning is valued by the staff, is of special interest. This research question is investigated through two kinds of approaches. Firstly, through semi-structured interviews with kindergarten teachers and assistants, and secondly, by a literature review of existing kindergarten research. Both the interviews and the literature review research find that the staff in kindergarten prefer social skills before early literacy skills. This finding is discussed in the light of both the educational policy and the view of learning. Kindergarten is political defined as first part of education, but not as any kind of schooling. Learning ordinary literacy skills like letters, the alphabet or writing is therefore not included in the kindergarten's political mandate. Combined with what might be some resistance among the staff against working with early literacy skills, social inequalities can be enlarged when the staff in small degree read books, work with phonological awareness, and so on. Social inequalities can provide different prerequisites for mastering reading and writing at school and thus lifelong learning.

Compassion in Children's Peer Interaction

Keywords: Early childhood education, Emotion and affect, Social interaction, Video analysis

Presenting Author: Jaakko Hilppö, University of Helsinki, Finland; **Co-Author:** Antti Rajala, University of Helsinki, Finland; **Co-Author:** Lasse Lipponen, University of Helsinki, Finland

Peers have a significant impact on children's learning and development (e.g., Rubin, Bukowski & Bowker, 2015; Sawyer, 2015; Corsaro & Eder, 1990). Interactions with other same age children not only influence children's social, cognitive and emotional competencies, but importantly constitute the very grounds for their development. While this body of work has significantly advanced our understanding of the nature of peer interactions, there is still a dearth of knowledge on how children orient to and address the worries, concerns or suffering of their peers in everyday settings, namely act with compassion. To this end, building on socio-cultural and cultural-historical theoretical frameworks (authors) in this paper we present our study of compassion in children's peer interactions. The empirical data comprise video records of social interactions (51h) in a Finnish public kindergarten. We identified all episodes in which a child expressed distress (15 episodes) and analyzed them with interaction analysis methods (Jordan & Henderson, 1995). Our results reveal how, in situations of peer distress, children took up and reproduced the compassionate practices that are endemic to their particular kindergarten community and take part in maintaining that culture. In specific, we could observe children verbalize and elaborate their peer's distress experience using strategies similar to those used by the adults in this kindergarten community. In addition, we also observed different ways in which children showed compassion which might be unique to children's peer cultures, like trying to playfully alleviate the distress of their peer.

Leading the team of day care centres towards high quality language education

Keywords: Early childhood education, Language (Foreign and second), Self-efficacy, Teacher professional development

Presenting Author: Elisabeth Resa, Free University Berlin, Germany; **Co-Author:** Itala Ballaschk, Freie Universität Berlin, Germany; **Co-Author:** Yvonne Anders, Freie Universität Berlin, Germany

Changes towards a culturally and linguistically more diverse society have led to new challenging expectations on Early Childhood Education and Care (ECEC) settings in Germany. Since high quality ECEC can make a decisive contribution to compensate for educational disadvantages at an early stage, the discussion about how to realise high pedagogical quality in ECEC is currently of high interest. The quality of language education is of special importance since language skills are key to educational success. Against this background, defining the requirements for high quality language education in ECEC is crucial. Research showed a positive association of professional exchange within the team of day-care centres with the development of language-related process quality and points to the importance of the centre head promoting professional exchange. Using data from 190 childcare centres and 1361 preschool teachers, the present study examines the influence of the centre head's collaboration with the team on common goals and professional exchange and on the team climate. Furthermore, it is assumed that common goals and professional exchange as well as the team climate affect teachers' perceived self-efficacy in the area of language education, which in turn could explain the previously reported positive impact of professional exchange and language-related process quality. Results show a positive relation of the centre head's cooperation with the team with common goals and professional exchange as well as team climate. Common goals and professional exchange in turns are positively related to teachers' language-related perceived self-efficacy.

Session R 16

16 August 2019 08:30 - 10:00

Seminar Room - S16

Single Paper

Assessment and Evaluation, Higher Education, Motivational, Social and Affective Processes

Achievement

Keywords: Achievement, Assessment methods and tools, Goal orientation, Learning approaches, Motivation, Motivation and emotion, Primary education, Reading comprehension, Self-regulation

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion

Chairperson: Kristiina Kumpulainen, University of Helsinki, Finland

"What is my next step?" Student perceptions of feedback helpfulness

Keywords: Achievement, Assessment methods and tools, Learning approaches, Primary education

Presenting Author: Cam Brooks, The University of Queensland, Australia; **Presenting Author:** Rochelle Burton, The University of Queensland, Australia; **Co-Author:** Yangtao Huang, The University of Queensland, Australia; **Co-Author:** Annemaree Carroll, The University of Queensland, Australia; **Co-Author:** John Hattie, The University of Melbourne, Australia

Abstract The aim of this study was to investigate school student perceptions of feedback and validate a student feedback perception questionnaire based upon Hattie and Timperley's (2007) model of feedback. The study is framed by the research question: *Which types and levels of feedback are most helpful to students during the completion of an English writing task?* In order to answer this question, a student feedback perception questionnaire (SFPQ) was designed and used to gather data about the helpfulness of different feedback types and levels. Results demonstrate construct validity for the questionnaire and notably, students report that improvement based feedback is the most helpful to learning.

Phonic Difficulties in Early Education: Implications for Future Reading Performance

Keywords: Achievement, Assessment methods and tools, Primary education, Reading comprehension

Presenting Author: Joshua McGrane, University of Oxford, United Kingdom; **Co-Author:** Kit Double, University of Oxford, United Kingdom; **Co-Author:** Jamie Stiff, University of Oxford, United Kingdom; **Co-Author:** Therese N. Hopfenbeck, University of Oxford, United Kingdom

The role of phonics in early reading development has been the subject of significant conjecture. Recently, England has implemented a phonics screening check to assess the phonetic decoding of 6-year old students. Students who fail this phonics check are obliged to re-take the assessment the following year. We compare the performance of students who pass this check (pass) and students who fail the original assessment but pass the re-take assessment (fail-pass), with students who fail both the original and re-take assessments (fail-fail). Using data from the Key Stage 1 national assessment of reading and the Progress in International Reading Literacy Study (PIRLS), we examine the reading comprehension performance of these students approximately 1 and 4 years after the original phonics check. Results suggest that pass-fail students perform substantially better than fail-fail students ($d = .16$ to $.20$), even after performance on the original phonics check is controlled for. Effects of phonics category on reading engagement, liking, and confidence were also examined. While fail-pass students do not appear to entirely catch pass students, these results underscore the importance of intervening for those students who are identified as having problems with phonics in order to reduce later reading comprehension difficulties.

Assessment policies and academic performance: the role of motivation and self-regulation

Keywords: Achievement, Assessment methods and tools, Motivation, Self-regulation

Presenting Author: Rob Kickert, Erasmus University Rotterdam, Netherlands; **Co-Author:** Marieke Meeuwisse, Erasmus University Rotterdam, Netherlands; **Co-Author:** Karen Stegers-Jager, Erasmus MC, Institute of Medical Education Research Rotterdam, Netherlands; **Co-Author:** Gabriela Koppenol-Gonzalez, Erasmus University Rotterdam, Netherlands; **Co-Author:** Lidia Arends, Erasmus University Rotterdam, Netherlands; **Co-Author:** Peter Prinzie, Erasmus University Rotterdam, Netherlands

Despite the frequently reported association of characteristics of assessment policies with academic performance, the mechanisms through which these policies affect performance are largely unknown. Therefore, the current research investigated performance, motivation and self-regulation for two comparable groups of students following the same statistics course, but under two assessment policies: Education and Child Studies (ECS) students studied under an assessment policy with relatively higher stakes, a higher performance standard, and a lower resit standard, compared with Psychology students' policy. Results show similar initial performance, but more use of resits and higher final performance (post-resit) under the ECS policy compared with the Psychology policy. In terms of motivation and self-regulation, under the ECS policy significantly higher minimum grade goals, performance self-efficacy, task value, time and study environment management, and test anxiety were observed, but there were no significant differences in aimed grade goals, academic self-efficacy, and effort regulation. The relations of motivational and self-regulatory factors with academic performance were similar between both assessment policies. Thus, the higher academic performance under the higher stakes, higher performance standard, lower resit standard assessment policy of ECS, seems to result from higher motivation and self-regulation, but not from different associations of motivation or self-regulation with performance. Concluding, educators should be keenly aware of how the stakes, performance standard and resit standard of the assessment policy are related to students' motivation, self-regulation and academic performance.

It takes two hands to clap: Combining grit and educational-goal commitment to predict achievement

Keywords: Achievement, Goal orientation, Motivation, Motivation and emotion

Presenting Author: Xin Tang, University of Helsinki, Finland; **Co-Author:** Jiesi Guo, Australian Catholic University, Australia; **Co-Author:** Allan Wigfield, University of Maryland, United States; **Co-Author:** Katariina Salmela-Aro, Helsinki University, Finland

The present study aims to examine whether grit, synergically with education-related goal commitment, could foster academic achievement. Drawing samples from Finnish secondary school ($N = 1,164$; 57.4% female; 8th grade) and using person-oriented approach, we identified four groups among educational-goal commitment and grit (examined as two dimensions, perseverance of effort and consistency of interest). The results showed that the students group which had both a high-level commitment toward education and a high level of perseverance of effort displayed the highest achievement than other groups. This study

provides one possible reason about why previous studies failed to find strong grit effect on achievement and highlights the unique contribution of person-oriented approach.

Session R 17

16 August 2019 08:30 - 10:00

Seminar Room - S03

Single Paper

Cognitive Science, Higher Education

Writing and Literacy in Higher Education

Keywords: Achievement, Argumentation, At-risk students, Cognitive skills, Collaborative Learning, Competencies, Doctoral education, Experimental studies, Higher education, Reading comprehension, Student learning, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Andreas Lachner, University of Tübingen, Germany

Effects of a writing fluency training on lower and higher level writing skills

Keywords: At-risk students, Cognitive skills, Competencies, Writing/Literacy

Presenting Author: Sabine Stephany, University of Cologne, Germany; **Presenting Author:** Evghenia Goltsev, University of Cologne, Germany; **Co-Author:** Valerie Lemke, Mercator Institute for Literacy and Language Education, Germany; **Co-Author:** Marion Krause-Wolters, University of Cologne, Germany; **Co-Author:** Pia Claes, University of Cologne, Germany; **Co-Author:** Hilde Haider, Lehrstuhl für Allgemeine Psychologie I, Germany; **Co-Author:** Hans-Joachim Roth, University of Cologne, Germany; **Co-Author:** Michael Becker-Mrotzek, University of Cologne, Germany

The ability to compose a text is crucial to students' success in school. One important prerequisite for developing adequate writing competence is the mastery of lower level skills. Current international research shows that writing fluency is an important lower-level skill involved in writing. It shows for example that writing fluency correlates with text composition. Writing fluency is said to build a bridge between transcribing and text composition. Little is known about the effects of writing fluency trainings on automatized and controlled writing processes as well as on text quality. The aim of the present study is to investigate the effects of a writing fluency training on fluency aspects and on text quality. To address these issues a writing fluency training was developed comprising tasks that should foster both the automatized retrieval (transcription fluency) as well as controlled processes (text generation fluency). The study was a pre-post-control group

design. Participants were 120 6th grade students (11 to 13 years). Transcription fluency was measured on the letter, word and sentence level. Text generation fluency on the text level was measured by bursts. Data on text generation fluency were recorded using digital smartpens. Results show a greater increase in transcription fluency of the treatment group than of the control group (p

Validation of the Writing Process Questionnaire in the Estonian context

Keywords: Achievement, Doctoral education, Higher education, Writing/Literacy

Presenting Author: Djuddah Leijen, University of Tartu, Estonia; **Co-Author:** Anni Jürine, University of Tartu, Estonia; **Co-Author:** Gerli Silm, University of Tartu, Estonia; **Co-Author:** Adriano Augusto, University of Tartu, Estonia

The aim of this study is to validate the Writing Process Questionnaire in the Estonian context. In recent years, Estonia has seen PhD candidates failing to graduate on time. Despite recent efforts to improve the situation, less than a third of PhD students manage to complete their studies in their nominal period (Vassil & Solvak, 2012). The survey was used to initiate a better understanding of the factors that may explain some of these delays and was distributed among all PhD student lists in Estonia. 619 students responded to the survey. CFA confirmed the original structure of the questionnaire. Similarly to previous studies, the results indicate that PhD students see writing as knowledge transforming process, however they also experience procrastination to some degree and report low on productivity. Perfectionism and writing blocks were reported less. PhD students tended to disagree that writing is an innate ability indicating that students have a readiness to develop as writers and support for this readiness should be supported by the university.

A cognitive load perspective on the effectiveness of collaborative writing

Keywords: Cognitive skills, Collaborative Learning, Student learning, Writing/Literacy

Presenting Author: Elke Van Steendam, KU Leuven, Belgium; **Co-Author:** Elise Drijbooms, KU Leuven, Netherlands; **Co-Author:** Huub Van den Bergh, Universiteit Utrecht, Netherlands; **Co-Author:** Gert Rijlaarsdam, University of Amsterdam, Netherlands

There is little empirical evidence that collaborative learning always guarantees positive individual learning outcomes and studies show that the effectiveness of collaborative learning depends on a complex interplay of individual, collaborative and contextual factors. One of these factors is task complexity and its interaction with the limitations of the human cognitive architecture. Kirschner et al. (2011) have shown that for learning tasks, collaborative learning is superior to individual learning for high-complexity tasks, but inferior for low-complexity tasks. For high-complexity tasks, sharing the task's intrinsic cognitive load through collaborative learning, reduces the risk of exceeding the individual learner's working memory. This so-called collective working memory effect (CWME) has not yet been examined for collaborative writing. Nevertheless, as writing is inherently a complex learning activity, the question is whether the CWME also holds up for writing tasks with varying degrees of complexity. To investigate this question, 182 Belgian undergraduate students wrote a complex summarizing task, or a highly complex synthesis writing task, either individually or collaboratively. In each of the four experimental conditions of the 2x2 factorial between-subjects design, students' writing performance and cognitive load were assessed both during the (collaborative or individual) learning phase and an individual post-test (i.e., the transfer phase). Results show that writers learning a complex summarizing task collaboratively achieved higher performance and invested less cognitive load than individual learners, both during the learning phase and in the individual posttest. For the highly complex writing tasks, by contrast, collaborative learning led to a lower performance than individual learning.

Improving university students' written argumentation via recursive reading: An intervention study

Keywords: Argumentation, Experimental studies, Reading comprehension, Writing/Literacy

Presenting Author: Christian Tarchi, University of Florence, Italy; **Co-Author:** Ruth Villalon, University of Cantabria, Spain

The present study analyzed the efficacy of an intervention aimed at scaffolding readers' "recursivity" (i.e., going back to the texts) while reading multiple texts and writing an argumentative essay. The participants were 144 university students, randomly assigned to two conditions: intervention (Recursivity-induced, RI) and active control (AC). We collected data about participants' high school grade, thinking dispositions, perceived prior knowledge and perceived level of instruction in argumentative writing received, and prior beliefs. Then, students were assigned two texts about the evaluation of teacher issue, one pro and one against. RI students were prompted to compare the argumentation of each text with their own prior beliefs, whereas AC students were asked to write a summary of each text. Process-level data were collected through the software ©Kidlogger. Immediately after reading the texts, students were asked to write an argumentative essay to express their opinion on the topic. Three weeks after students were asked to recall all the information read from the two texts. Results confirmed the efficacy of an intervention aimed at increasing students recursivity when reading texts and when writing the essays. The intervention positively influenced students' analysis of the belief-inconsistent text, the overall argumentative quality of their essay, and valid inferences made in the recall task three weeks after. The intervention may increase its efficacy if matched with a high level of academic abilities and with a high dispositional level.

Session R 18

16 August 2019 08:30 - 10:00

Seminar Room - S07

Single Paper

Motivational, Social and Affective Processes

Educational Psychology, Motivation and Emotion

Keywords: Case studies, Educational Psychology, Emotion and affect, Motivation and emotion, Peer interaction, Quantitative methods, Self-regulation, Social interaction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Barbara Beege, Ludwig-Maximilians-Universität (LMU), Germany

Trajectories of Social Media Use Across Adolescence and their relation to academic well-being

Keywords: Educational Psychology, Motivation and emotion, Peer interaction, Social interaction

Presenting Author:Erika Maksniemi, University of Helsinki, Finland; **Co-Author:**Lauri Hietajärvi, University of Helsinki, Finland; **Co-Author:**Kirsti Lonka, University of Helsinki, Finland; **Co-Author:**Katariina Salmela-Aro, Helsinki University, Finland

Digital activities have become an integral part of daily life and especially social media appears to draw people to engage in a state of constant presence throughout all times of day and within all activities, including academic. There are well-known benefits of social media use (SMU), but for some people the constant engagement has been shown to be related to both long- and short-term negative outcomes. In a school context excessive use of digital media has been shown to be associated with increased school-related cynicism and SMU to overall school burnout over time. However, it is still quite unknown how different trajectories and overall frequency of SMU are related to different negative or positive outcomes. This longitudinal study (N=2667) from early to late adolescence (age 14 to 17) utilized a growth mixture model to identify trajectories of SMU and their relation to academic and emotional functioning. A model with four distinct trajectories was selected: 1) Stable-low users, 2) Stable-moderate users, 3) Increasing-moderate users and 4) Increasing-High users. The four trajectories differed in academic well-being (operationalized as School Burnout Inventory and Schoolwork Engagement Inventory) in the last measurement time. Stable-low users reported less negative outcomes. Increasing-high and Stable-moderate users reported more school-related exhaustion than Stable-low users. Increasing-moderate users reported less cynicism towards school than Stable-moderate or Increasing-high users. Increasing-moderate users reported most engagement towards schoolwork and differed significantly from Increasing-high users. We argue that it matters how the SMU develops across adolescence because different trajectories are related to different outcomes.

Attention bias in test anxiety: The moderating effect of approach-avoidance temperament

Keywords: Educational Psychology, Emotion and affect, Motivation and emotion, Quantitative methods

Presenting Author:Wendy Symes, University of Birmingham, United Kingdom; **Co-Author:**Dave Putwain, Liverpool John Moores University, United Kingdom

Previous studies have shown that test anxiety is related to attention bias. It is not clear, however, whether attention bias in test anxious individuals is always characterised by an attention bias towards threat, and whether this bias is the result of automatic or conscious processes. In the present study, approach-avoidance temperament was included as a possible moderator of the test anxiety and attention bias relationship. Attention bias was measured using a dot probe task, with threat and neutral stimuli presented subliminally and supraliminally. High test anxious persons showed attention bias towards supraliminal threat stimuli. Attention bias was only shown to subliminal threat stimuli in high test anxious persons with a strong approach temperament. This suggests that the mechanism for attention bias to threat stimuli in high test anxious persons involves both automatic and conscious processes.

The role of temperament in secondary students' mathematics interest, strain, and effort

Keywords: Educational Psychology, Emotion and affect, Motivation and emotion, Quantitative methods

Presenting Author:Anna Rawlings, University of Helsinki, Finland; **Co-Author:**Anna Tapola, University of Helsinki, Finland; **Co-Author:**Markku Niemivirta, University of Oslo, Norway

Individual characteristics such as personality and skill levels are known to influence students' evaluations of the learning context and their subsequent learning intentions. In the present research, we examined the impact of temperamental sensitivities, namely, punishment sensitivity, interindividual reward sensitivity (i.e., reward derived from praise or attention), and intraindividual reward sensitivity (i.e., reward derived from novelty and own inner states) on secondary students' (N = 261) mathematics interest, strain, and effort. Further, we examined the effects of mathematics interest, strain, and effort on the students' performance on a mathematics task. The effects of gender and previous achievement in mathematics were controlled. Findings from Exploratory Structural Equation Modeling showed mathematics grade to be a positive predictor of mathematics interest and effort, and a negative predictor of strain. In line with our expectations, intraindividual reward sensitivity predicted mathematics interest and effort positively, whereas punishment sensitivity and interindividual reward sensitivity positively predicted mathematics strain. Boys were found to be more interested in mathematics than girls, and girls to experience more mathematics strain than boys. Also punishment sensitivity was higher among the girls. Even though girls' mathematics grades were on average higher, boys' task performance was better. Our findings suggest that temperamental sensitivities have an influence on motivational experiences in a central academic domain, even when accounting for gender differences and previous achievement. Taking these sensitivities and their motivational contingencies into account, therefore, appears important both for educational practice and future research.

The role of mental health in adaptive regulation of learning and student success

Keywords: Case studies, Educational Psychology, Motivation and emotion, Self-regulation

Presenting Author:Sarah Davis, University of Victoria, Canada; **Co-Author:**Allyson Hadwin, University of Victoria, Canada; **Co-Author:**Rebecca Edwards, University of Victoria, Canada; **Co-Author:**Todd Milford, University of Victoria, Canada

This study examined the interplay of mental health and self-regulated learning (SRL). Participants were 160 students enrolled in an undergraduate learning-to-learn course where students learned about SRL theory and how to apply it to their own learning. Using a case study approach, two groups of students were formed based on their within-person mean scores on a weekly mental health measure (Keyes et al., 2008). Students with lower mental health experienced more planning challenges, reported using less specific strategies when experiencing mental health challenges, and reported using more passive strategies. Students with higher mental health reported more cognition, mental health, and strategy challenges. They also reported using more specific strategies when experiencing mental health challenges, for example help-seeking. Other findings revealed differences in how these two groups engaged with the course learning management system through log file data. This study contributes to the field by examining the interplay between mental health and SRL over time as a process, which limited previous research has done. Implications for theory, research, and practice are discussed.

Session R 19

16 August 2019 08:30 - 10:00

Seminar Room - S14

Single Paper

Developmental Aspects of Instruction, Motivational, Social and Affective Processes

Parental Involvement and Competencies

Keywords: Competencies, Developmental processes, Educational attainment, Language (L1/Standard Language), Motivation, Motivation and emotion, Out-of-school learning, Parental involvement in learning, Primary education, Social interaction, Student learning

Interest group: SIG 08 - Motivation and Emotion, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Matias Rojas, Pontificia Universidad Católica de Chile, Chile

Non scholae sed vitae!? Parents' educational values, future prospects, and parenting behaviour

Keywords: Educational attainment, Motivation, Parental involvement in learning, Social interaction

Presenting Author:Kerstin Helker, RWTH Aachen University, Germany

There is substantial body of research focusing on parents' direct and indirect involvement in their child's education and how parental hopes and aspirations

affect students' values and learning goals. Parental involvement has however been found to be influenced by parents own schooling and educational achievements. Based on this, this study hypothesises that parents' view of their own and their child's future may affect overparenting practices as well as their ratings of the usefulness of schooling for their child. Results from a study with 501 parents showed that parents' time attitudes correlated with their scepticism about the use of school for future success ($r = .29$ p

Students' well-being and competencies after school transition

Keywords: Competencies, Motivation and emotion, Parental involvement in learning, Student learning

Presenting Author: Michaela Glaeser-Zikuda, University of Erlangen-Nuremberg, Germany; **Co-Author:** Ramona Obermeier, Institute for Educational Science, University of Erlangen-Nuremberg, Germany

Well-being of adolescents at school is influenced by a variety of internal and external variables (Hascher, 2004). Previous research focused mainly on determinants of students' well-being separately from each other and neglected the influence of the familial background although the impacts of the socio-economic status and perceived parental behavior have been already proven (Lazarides & Watt, 2017; Simpkins et al., 2012). A survey was carried out based on data of $N = 1303$ students (77.3% female, age: $M = 10.24$; $SD = 1.01$) from secondary catholic schools in Germany. Standardized scales were applied for the interrogation. To analyze how students' cognitive well-being and competencies after school transition are influenced by individual, familial and scholastic determinants a linear regression ($F(30,572) = 43.32$; $p < .00$; $R^2 = .68$) was calculated. Results show a high impact of instructional quality on cognitive well-being ($\beta = .34$, $p < .00$), as well as a low effect of parental support regarding homework ($\beta = .10$, $p < .00$) and performance related parental pressure ($\beta = .07$ $p < .03$). We also found some moderating effects of instructional quality and school-related parental support and different effects for performance-differentiated groups. Discussing these results, it should be taken into account that the composition of the sample is very specific (high number of female respondents, a high percentage of mono-educative (girls') schools and disproportionately numerous highly educated parents). Further results and implications for instruction and the cooperation between school and parents will be discussed.

Parental involvement and homework quality and control on children's homework motivation and behavior

Keywords: Motivation, Out-of-school learning, Parental involvement in learning, Primary education

Presenting Author: Claudia Kastens, Bergische University Wuppertal, Germany

Homework assignments seem to have positive effects on achievement if homework motivation (self-efficacy beliefs and values) and homework behavior (effort and time spent on homework) are high. Research on parental involvement on homework suggests that parents should follow a process orientated guidance approach, meaning that they should only help when asked and that they should neither control nor punish or reward their children for their homework assignments. Teachers should develop challenging assignments and not just check students' homework completion. Most research in this field has been conducted on samples of secondary school children. Whether these assumptions hold for elementary school students is addressed in this study on the basis of data from a sample of 437 German 3rd and 4th grade students. The study does not confirm any effects of parental involvement or homework quality and control on the amount of homework completion. However, parents' supportive involvement and verification of homework effort by the teacher has substantial positive effects on homework effort and both indicators of homework motivation. Students who report having arguments with their parents display lower homework self-efficacy beliefs, values, and effort. Negative effects also show for the adaptivity of homework assignments in regard to students' achievement level: Students' perception of this practice is related to lower homework self-efficacy beliefs, values, and effort.

Development of the comprehension of clause connectors of German primary school children

Keywords: Competencies, Developmental processes, Language (L1/Standard Language), Primary education

Presenting Author: Anna Volodina, University of Bamberg, Germany; **Co-Author:** Sabine Weinert, University of Bamberg, Germany; **Co-Author:** Birgit Heppt, Humboldt-Universität zu Berlin, Germany

Academic language competencies have been shown to be an important predictor of success across various school subjects. However, to date, only few studies have investigated their development across primary school age. As the comprehension of clause connectors is an important facet of academic language, we investigated its development in German monolinguals and language minority learners across primary school age on the basis of a newly developed and validated test instrument. Drawing on a German sample of $N = 627$ children (57.6 % language minority learners) in Grades 2 to 4, we found evidence of a compensatory effect, with students who exhibited relatively low achievement in Grade 2 in both language groups showing greater gains over the following two years. In addition, results of full growth curve models underline the impact of the families' cultural capital (i.e., number of books at home) and parental education on the initial level and of children's non-verbal cognitive abilities and cultural capital on the growth rate of the comprehension of clause connectors. Our results indicate the need of early and continuous sensitization of children for the register of academic language.

Session R 20

16 August 2019 08:30 - 10:00

Lecture Hall - H09

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools in Higher Education

Keywords: Assessment methods and tools, Educational Psychology, Higher education, Learning Technologies, Qualitative methods, Quantitative methods, Reasoning, Self-efficacy, Student learning, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education

Chairperson: Rocio Garcia-Carrion, University of Deusto, Spain

The origins of feedback and its strange metaphorical use in education

Keywords: Assessment methods and tools, Higher education, Qualitative methods, Teaching/instruction

Presenting Author: David Boud, University of Technology Sydney/ Deakin University, Australia; **Co-Author:** Joanna Tai, Deakin University, Australia

There are multiple potential origins of the idea of feedback, including biological, sociological (group dynamics), and cybernetics traditions. The term was adopted in educational contexts around the 1950s. In this transfer to education, we argue, feedback should have become a metaphor for a particular set of educational practices. However, a different view of feedback—information provided to learners about their work—has been widely adopted in recent years. Such a use shows little resemblance to its use in other traditions. In particular, it regards feedback as an input and not a process in which learners are necessarily party. However, such a use of feedback has shaped our conceptions of feedback in education, and in educational research on it. This paper analyses key texts from the mid 20th century to establish the emergence of the educational use of feedback as a concept. It explores the multiple roots of the term, tracing their overlap and interplay between origins, and interpretations within educational contexts. Comparisons will be made to current-day educational practices. Finally, the paper considers how conceptualisations and metaphors may cause us to neglect important opportunities in improving educational practice through feedback in educational settings, or serve to advance understanding of feedback as related to learning.

A comparison of summative and formative use of self-assessment in higher education

Keywords: Assessment methods and tools, Higher education, Self-efficacy, Student learning

Presenting Author: Juuso Henrik Nieminen, University of Helsinki, Finland; **Co-Author:** Henna Asikainen, University of Helsinki, Finland; **Co-Author:** Johanna Rämö, University of Helsinki, Finland

Self-assessment has often been portrayed as a way to empower students in higher education. However, many scholars have stated that self-assessment, when

counting towards grades, leads into surface approach to learning and cheating. Formative assessment, containing self- and peer-assessment, has been introduced as a way to promote deeper kind of learning. In this study, we empirically compared two different models for self-assessment (N = 299) within the same course context. Another model used self-assessment in a formative way while the course grade was still based on an exam, and the other model introduced self-assessment as a summative, empowering act by letting the students decide their final grade after formatively practicing self-assessment skills just like in the other model. This comparative study design uses latent profile analysis as a person-oriented way to observe student subgroups in both of the models in terms of deep and surface approaches to learning. The results show that the student profiles vary between the two self-assessment models, even though the learning environment was exactly the same for both groups, with the only exception being the final grading method. The students taking part in the summative self-assessment group were overrepresented amongst the deep oriented student profile. The study implies that summative self-assessment, based on self-grading but also on formative elements, is a possible way to promote deep approach to learning and greater self-efficacy.

Towards a more embedded view on situations in educational research

Keywords: Assessment methods and tools, Educational Psychology, Higher education, Quantitative methods

Presenting Author:Carla Bohndick, University of Hamburg, Germany; **Co-Author:**Gabriela Blum, University of Koblenz-Landau, Germany

There is a strong focus on personal variables in current educational research. Nevertheless, for understanding educational behavior, it is necessary to also take a look at situational variables. Even though the attempt is made again and again to systematize the learning environment and make it measurable, the intensity of the efforts falls far short of that of the description of persons. Additionally, those attempts often ignore research on persons instead of connect both research lines leaving a gap between research on persons and research on situations. One way to close this gap and to analyze situations while maintaining the connection to research on persons, is to use the parallel between person and situation. The goal of the theoretical study is to show what happens when we consistently use the parallelism between person and situation and transfer the principles of research on persons. In order to achieve this goal and to answer the question, we have collected typical principles for the investigation of individuals and applied them to situations. Thus, the principle "we want to make statements about the typical behavior of a person" can be translated into "we want to make statements about the typical behavior in a situation". Further principles are transferred and presented in the paper. The results show that it is worth utilizing the parallelism and transferring principles of research on persons to research on situations. Further implications are being discussed.

Effects of feedback and increased autonomy in computer-based assessment: A large-scale experiment

Keywords: Assessment methods and tools, Educational Psychology, Learning Technologies, Reasoning

Presenting Author:Mari-Paoliina Vainikainen, Tampere University, Finland; **Co-Author:**Sanna Oinas, University of Helsinki, Finland; **Co-Author:**Mikko Asikainen, University of Helsinki, Finland; **Co-Author:**Helena Thuneberg, University of Helsinki, Finland

The rapid development of technology and the constantly improving understanding of learning processes call for considerable changes in national educational assessment systems. In this large-scale experimental educational assessment study, we tested the effects of expected feedback, item-based feedback and increased autonomy on performance in quantitative and visuo-spatial reasoning tasks. We increased autonomy by giving the students a possibility to adjust the difficulty level of the test while taking it. We divided a random sample of 2032 Finnish 15-years-old students into six experimental groups on a computer-based educational assessment platform. The initial results showed that weakest students benefitted from expected feedback in both domains, but item-level feedback did not have straightforwardly interpretable effects even when looking at high- and low-performers, or girls and boys separately. However, in combination with freedom to choose difficulty level, item-based feedback on the one hand encouraged able students to challenge themselves more, but it also made low-performing students to lower their goals. The results of this study can be used for developing dynamic technology-based assessment and training systems further to enhance students' learning and to avoid traps related to potential harmful effects of new technologies.

Session R 21

16 August 2019 08:30 - 10:00

Seminar Room - S02

Single Paper

Assessment and Evaluation, Higher Education

Student Learning in Higher Education

Keywords: Assessment methods and tools, At-risk students, Culture, Doctoral education, Higher education, Informal learning, Interdisciplinary, Learning approaches, Mixed-method research, Student learning

Interest group: SIG 04 - Higher Education

Chairperson: Edith Braun, Justus-Liebig-Universitaet Giessen, Germany

Interprofessional education - development of university students' concept-level learning

Keywords: Higher education, Interdisciplinary, Mixed-method research, Student learning

Presenting Author:Erika Österholm, University of Turku, Finland; **Co-Author:**Mari Murtonen, University of Turku, Department of Teacher Education, Finland; **Co-Author:**Tuika Iiskala, University of Turku, Finland; **Co-Author:**Outi Kortekangas-Savolainen, University of Turku, Finland

Interprofessional education (IPE) offers knowledge and skills needed in working life for higher education students. There is evidence that students who had participated in interprofessional education displayed later more sophisticated understanding of relevant issues and contributing factors (Pollard, K. Rickaby, C. & Miers, M. 2008). This research studied how interprofessional learning environment connects with university students' learning on concept level. It was also explored whether students' individual metacognitive skills and perceptions of a group assignment connect with their concept level learning.

Students (N=52) from six healthcare and social disciplines took part into a new interprofessional study module. A mixed-methods pre- and post-test design was used. When comparing pre- and post-test results of the Inventory of Learning Styles (ILS) concerning students' critical processing skills, a significant difference was found. In other words, students' metacognitive skills evolved during the course. When measuring students' appraisals of group assignment (SAGA), they scored management, group assessment and interpersonal communication statistically significantly more positive than in the beginning of the course. The content analyses of the mind maps revealed development in students' concept level learning. The maps got more sophisticated in all three main concepts (pre 52%, post 75%). T-test revealed the difference to be significant (pre-test: M= 0.59, post-test: M= 0.68; t (43) -2.30, p = 0.027). However, a quarter of maps (25%) missed one of the pivotal concepts at the end of the course.

Self-regulated learning among international students: An analysis of learning strategy profiles

Keywords: At-risk students, Culture, Higher education, Student learning

Presenting Author:Hüseyin Hilmi Yildirim, FernUniversität in Hagen, Germany; **Co-Author:**Julia Zimmermann, FernUniversität in Hagen, Germany; **Co-Author:**Kathrin Jonkmann, FernUniversität in Hagen, Germany

Self-regulated learning includes the interplay of distinct constructs and processes (e.g., motivation, self-efficacy, and the use of learning strategies) and is highly relevant for study success. However, previous research on learning strategy profiles did not consider the specific learning practices and conditions of international students who try to succeed in a foreign educational system. In the current study, we used data from 3,180 international students at German universities to assess to what extent established learning strategy profiles (e.g., Creß & Friedrich, 2000) can be applied to this specific sample. We identified three learning strategy profiles (rehearsal strategy use profile, elaboration strategy use profile, maximal strategy use profile) that partly overlapped with previous profiles. Students in the rehearsal strategy use profile showed substantially lower levels of study satisfaction and higher drop-out intentions than students in the other two profiles. Overall, the findings pointed to cultural differences in self-regulated learning and emphasized the divergent prospects of academic success for students in the different learning strategy profiles. From an applied perspective, the learning strategy profiles could be used to tailor specific support offers to optimally encourage the academic success of international students at German universities.

Exploring approaches to learning in the PhD context

Keywords: Doctoral education, Higher education, Learning approaches, Student learning

Presenting Author:Telle Haalikari, University of Helsinki, Finland; **Co-Author:**Anna Parpala, University of Helsinki, Finland; **Co-Author:**Liisa Postareff, University of Turku, Finland

The purpose of the present study was to contextualise the approaches to learning to the PhD context and explore whether the same dimensions of approaches to learning may be identified as in other educational levels. The participants of the study were 420 PhD students from four different doctoral schools and they answered the HowULearn-questionnaire that was contextualised to the PhD context by a team of experts in university pedagogy. Exploratory factor analysis of the items was conducted in SPSS using Maximum Likelihood (ML) extraction with oblimin rotation. The results revealed that indeed three dimensions of approaches to thesis work were identified and theoretically interpretable: unreflective approach, deep approach and organised studying. The results provide support for the hypothesis that the approaches to learning are identifiable across various contexts, including PhD context. The present study represents a new perspective towards understanding PhD students' learning processes and difficulties they may experience during their PhD studies.

Validation of a scale to measure informal learning among students

Keywords: Assessment methods and tools, Higher education, Informal learning, Student learning

Presenting Author:Julian Decius, University of Paderborn, Germany; **Co-Author:**Niclas Schaper, University of Paderborn, Germany

Increasingly, the informal, self-determined learning of students, which takes place outside formal learning events, also plays an important role in the context of higher education at universities. Assuming that formal and informal learning can complement each other well, the framework conditions must be known with which informal learning can be promoted in higher education institutions. This is currently not the case to a sufficient extent - also because there is still no clear definition and assessment instrument for measuring the informal learning of students. This study therefore presents a new scale to operationalize informal learning in the higher education context. The concept of informal learning is initially defined as distinct from other related forms of learning. The new scale is based on a model from the field of vocational learning. An existing questionnaire based on this model has been adapted in language and content to the higher education context and is validated in two quantitative studies with students. Self-efficacy, study satisfaction and conscientiousness, which play an important role in informal learning, are used for construct validation. Possible limitations and the applicability of the questionnaire for lecturers and students will be discussed, as well as the use of the scale for further research.

Session R 22

16 August 2019 08:30 - 10:00

Lecture Hall - H07

Single Paper

Educational Policy and Systems, Lifelong Learning

Educational Policy

Keywords: Achievement, Bilingual education, Cognitive development, Early childhood education, Educational attainment, Educational policy, Educational Psychology, Motivation, Qualitative methods, Quantitative methods, School effectiveness, Technology, Vocational education

Interest group: SIG 18 - Educational Effectiveness, SIG 23 - Educational Evaluation, Accountability and School Improvement

Chairperson: Jasperina Brouwer, University of Groningen, Netherlands

Impact of tracking on school experience, attitudes and learning progress of upper secondary students

Keywords: Achievement, Motivation, Quantitative methods, Vocational education

Presenting Author:Jana Strakova, Charles University, Czech Republic; **Co-Author:**Jaroslava Simonova, Institute for Research and Development of Education, Faculty of Education, Charles University in Prague, Czech Republic

The aim of the paper is to contribute to the research of the impacts of tracking in upper secondary education. It studies the relationship between attended track, student cognitive and non-cognitive outcomes and school context. The school context is operationalized by the concepts of academic optimism (teachers) and academic futility (students). The relationships are studied in the Czech Republic that has highly stratified upper secondary education, with strong vocational education and large differences between individual tracks. The analyses are performed on the data from the Czech Longitudinal Study of Education. The data was collected in 2016 and 2018 on 4200 students attending the first, respectively the third year of upper secondary studies in different tracks. The students were tested in mathematics and reading, and a student questionnaire collected information on their educational and occupational aspirations, grades, socioeconomic background and attitudes. In 2018, the teachers teaching classes attending by sampled students were administered an electronic questionnaire collecting information on their attitudes. The analyses based mainly on multilevel structural equation modelling showed a big differences between individual tracks and complex relationships between attended track, student composition, learning progress, academic futility, and academic optimism.

Impact of preschool and early childhood provision on children's development in Rio de Janeiro

Keywords: Cognitive development, Early childhood education, Educational attainment, Educational policy

Presenting Author:Mariane Campelo Koslinski, Federal University of Rio de Janeiro, Brazil; **Co-Author:**Tiago Bartholo, Federal University of Rio de Janeiro, Brazil

The study analyzes children's development in their first two years at compulsory schooling (preschool) in Rio de Janeiro using iPIPS (International Study of Children Starting School) and assesses the impact of an early childhood education policy in the city of Rio de Janeiro. The data used in the analysis was based on three waves of data collection. Key research questions are: 1- What is the impact of attending preschool (as opposed to maturation effect) on children cognitive development? 2 - How do the children in Rio de Janeiro compare with learners in England and Scotland? 3- What is the impact of attending different early childhood education programs/provisions in Rio de Janeiro on children cognitive development? A representative stratified random sample of 46 Municipal Public Schools in Rio de Janeiro (2740 children) were selected to participate in the study. Regression discontinuity was used to investigate the impact of preschool, as opposed to maturation effect, on children cognitive development and growth curve models were used to estimate the impact of attending different early childhood education programs on children cognitive development. Preliminary analyses indicate: a) that starting points (baseline) and gains in the first year of school are much different comparing learners from Rio de Janeiro, England and Scotland; b) a small positive impact of Child Development Centers Preschools .13 effect size for language development; d) small effect of frequenting preschool on children cognitive development.

Teacher perceptions of English learner students and the moderating role of bilingual education

Keywords: Bilingual education, Educational policy, Educational Psychology, School effectiveness

Presenting Author:Hanna Dumont, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Ilana Umansky, University of Oregon, United States

Teacher perceptions have been shown to be biased by student characteristic independent of the attribute of perception. As teacher perceptions can have a powerful impact on students' academic pathways, this poses a threat to educational equity. The aim of this study is to analyze teacher perceptions of students who are classified as English learner (EL) students – a large but vulnerable group of students in the U.S. with systematically less access to educational, social, and economic resources. Using data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010-2011, a federally-collected nationally-representative sample of U.S. kindergarten students, we address research questions: (1) What is the impact of EL status on teachers' perceptions of students' academic skills? (2) How does this relationship vary for students in bilingual versus monolingual English programs? Taking advantage of variation in EL

thresholds across district and state lines, we employ both ordinary least squares (OLS) and coarsened exact matching (CEM) analytic strategies to address these two research questions. We find that students' EL status negatively impacts teachers' academic perceptions across subject areas. Moreover, teachers have, on average, higher academic perceptions of students' literacy skills when EL classified students are taught in bilingual instructional environments compared to monolingual English instructional environments.

Improving school administration through information technology?

Keywords: Educational policy, Qualitative methods, Technology, Vocational education

Presenting Author:Eveline Wittmann, Technische Universität München, Germany; **Presenting Author:**Markus Dormann, Fernfachhochschule Schweiz, Switzerland

In recent years, digital technology has significantly changed the organisational set-up of public institutions, including schools, and their effectiveness and efficiency. In this paper, we use interview data from a sample of 51% of the head teachers of vocational school centres in the jurisdiction of Bavaria to argue that, firstly, bureaucratic features largely explain how external requirements stemming from digitalisation are processed within schools, e.g. by creating additional specialisations and positions, or introducing new rules and procedures to respond to those requirements at an organisational level. Based on Fountain's (2001) Technology Enactment Framework (TEF), we secondly contend that a redefinition of the nature of the bureaucratic features of school organisations has taken place. This means that, in a circular process, digital requirements transform the bureaucratic features of school organization. Thirdly, we argue that the effects of digital technology on the performance and efficiency of schools as bureaucratic organisations are ambivalent. The examples presented here seem to highlight that gains in efficiency or reductions of losses in efficiency caused by digitalisation are mostly caused by the concrete use of digital technology within the respective school organisation.

Session R 23

16 August 2019 08:30 - 10:00

Seminar Room - S05

Single Paper

Teaching and Teacher Education

Pre-Service Teacher Education and Teacher Professional Development

Keywords: Case studies, Doctoral education, Mixed-method research, Pre-service teacher education, Reflection, Self-regulation, Teacher professional development, Video analysis, Vocational education

Interest group: SIG 11 - Teaching and Teacher Education, SIG 16 - Metacognition

Chairperson: Mikko Aro, University of Jyväskylä, Finland

Preservice Teachers' Professional Vision for and Capacity to Teach SRL: Effects of Scaffolding Level

Keywords: Pre-service teacher education, Self-regulation, Teacher professional development, Video analysis

Presenting Author:Tova Michalsky, Bar-Ilan University, Israel

Self-regulated learning (SRL) poses significant challenges for preservice teachers. Teaching SRL requires the development of teachers' professional vision (PV) as it extends into the domain of teaching SRL, termed PV for SRL. This study explores the training effects for three PV scaffolding levels on preservice teachers': (a) video-analysis of SRL-teaching events and (b) actual SRL-teaching. Focusing on improving teachers' PV for SRL processes (noticing/describing/explaining/predicting) and teaching SRL measured by implicit/explicit SRL-promoting strategy instruction, this research offers an important contribution to preservice teachers' preparation programs. Participants were 102 preservice physics teachers during the practicum phase of their training at six universities in Israel. They were assigned in three groups differing by PV scaffolding level: guided, hinted (designed for this study) and self-guided. They received training and practicing in PV-for-SRL-mapping during video-analysis, differing by intervention group. Results revealed significant effects of Time and of Time × Group interaction on each of the four PV-for-SRL-mapping components (noticing, describing, explaining, predicting). Additionally, all three PV-instructional groups showed significant gains over time in both implicit and explicit actual teaching to promote students' SRL strategies. Participants in the hinted group outperformed the guided group, which in turn outperformed the self-guided group. Also, participants in all three PV-instructional groups revealed better implicit than explicit promotion of SRL strategies at each of the time intervals. The outcomes suggest that PV training to enhance SRL-teaching may be best supported by the hinted approach, blending guidance regarding timing with autonomy provision regarding the search for relevant prior knowledge.

Reflective practice and role concepts of mentors in Hungarian initial teacher education

Keywords: Mixed-method research, Pre-service teacher education, Reflection, Teacher professional development

Presenting Author:Kinga Kaplar-Kodacsy, Eötvös Loránd University, Hungary; **Co-Author:**Helga Dorner, Central European University, Hungary

This research aims to deal with an important, but empirically less studied field of initial teacher education in Hungary: concepts of mentorship and approaches to developing reflective practice in ITE in the larger context of adult learning models. This project builds on well-established international research and frameworks relating to the conceptualization of the roles of mentor teachers and their professional identity construction; provides insight into challenges mentors and mentees face in their practice; maps out mentoring concepts of university teacher educators and mentor training directors. It also reflects on results from feedback of school students on mentees' performance. This research has been put into a triangle (Cohen & Manion, 2000) of a mixed method approach (Creswell, 1997), that is, we used multiple tools and data sources, contrasted and compared the results and integrated the qualitative and quantitative data through a transformative process. We found a mutual agreement on the significant impact of the mentoring activity on teacher training and the key role of mentors. However, the role functions and competences set out in the mentorship programs are implemented in a variety of ways by the different actors of the process according to their beliefs, needs and the degree of motivation for involvement in the program.

Potentials and Challenges of International PhD-Programs in Teacher Education

Keywords: Case studies, Doctoral education, Pre-service teacher education, Teacher professional development

Presenting Author:Christian Kraller, Teacher Education and School Research, Austria; **Presenting Author:**Vasileios Symeonidis, University of Innsbruck, Austria; **Co-Author:**Irma Eloff, University of Pretoria, South Africa

The aim of this paper is to explore the potentials and challenges of developing and implementing international doctoral programs in teacher education. Teacher education systems worldwide struggle with challenges posed by globalization. To address those issues, two university consortia, one in Europe and one in Africa, developed international doctoral programs in teacher education (Eloff et al., 2018a). Specifically, the European Doctorate in Teacher Education (EDiTE) and the Doctoral Network for Teacher Education in Africa (DNTEA) brought together different teacher education institutions from different countries in order to provide joint doctoral training and promote international perspectives in teacher education. Adopting a case study approach, we explore the process of developing and implementing those two programs. To do so, data were collected from document review and autobiographical narratives of project participants and were analyzed with the method of thematic analysis. Findings suggest that: i) the creation of continental doctoral networks in teacher education represents a pattern-change at the conceptual level for addressing global educational challenges; and that ii) international doctoral networks in teacher education can contribute to local challenges at the national level, whilst concurrently opening avenues for new patterns of educational solutions to emerge.

Video-based competence assessment in the vocational training course in metal technology (ViKobeL MT)

Keywords: Pre-service teacher education, Teacher professional development, Video analysis, Vocational education

Presenting Author:Felix Walker, Technical University of Kaiserslautern, Germany; **Co-Author:**Andrea Faath-Becker, Technical University of Kaiserslautern, Germany

The main goal of this project is to develop an instrument to measure professional competence of students in vocational teacher education in Germany. The application of video vignettes as one solution approach is examined for its suitability to gain professional competence. Therefore in a first step we developed a

theoretical framework referring to a model of professional competence which differentiates between reflective (RK) and action-related (AK) competence components. Class observation is based on both visual and depth structures with its characteristics of effective teaching, e.g. cognitive activation of pupils or teacher feedback. Second we recorded real lessons by means of standardised videography and split them into sections to identify the characteristics of teaching quality. In addition, the calculation of the evaluation objectivity of two observers is expected to be meaningful with regard to the assessment of professional competence. Up to now, we developed 21 video vignettes in the two dimensions of professional competence RK (13) and AK (8), which could be very well identified on the basis of the theoretical framework. The analyses on evaluation objectivity have not yet been completed. A first feature-specific examination indicates large fluctuations, e.g. Cohens Kappa varies between the RK ($k = 0.64$) and AK ($k = 0.47$). In summary, it can be stated that for the first time theory-based video vignettes were developed for the vocational teacher training course. The critical reflection on the extent to which the requirements for competence-developing teacher education can be fulfilled will be discussed.

Session S 1

16 August 2019 10:15 - 11:45

Lecture Hall - H10

Symposium

Teaching and Teacher Education

Differentiated instruction from the present to the future

Keywords: Instructional design, Pre-service teacher education, Primary education, Qualitative methods, Quantitative methods, Secondary education, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Katrien Struyven, Belgium

Organiser: Júlia Grifol Freixenet, Vrije Universiteit Brussel (VUB), Belgium

Organiser: Katrien Struyven, Belgium

Discussant: Anouschka van Leeuwen, Utrecht University, Netherlands

This symposium, 'Differentiated instruction from the present to the future', focuses on creating learning environments that aim to develop the potential of all learners by means of Differentiated Instruction (DI), adapting classroom instruction to student differences in interests, readiness and learning profile. Four papers adopt different measurements, targeting experts, teachers in schools and pre-service teachers in teacher education in Germany, the Netherlands and Belgium. A multitude of methods are presented to study the complex realities of DI. Starting with the paper of Keuning and van Geel the complexity of Differentiated Instruction is investigated by means of Cognitive Task Analysis in the context of primary schools for Mathematics. Teachers and experts identify the knowledge and skills which are needed for Differentiated Instruction. In the second paper, Grifol-Freixenet and colleagues adopt the DI-Quest model to investigate pre-service teachers' philosophy and practices of DI. In the third paper, Pozas and Schneider go a step further, studying the factors which affect teachers' adoption of differentiated instruction. Finally, Gheysens and colleagues try to bridge the gap between self-report measures and teachers' competences in the classroom. They investigate by means of video-based comparative judgement, whether teachers' noticing of inclusive practices of teaching (in comparison to experts' judgements) predicts their self-reported philosophy and practices of differentiated instructions. Obviously, similarities and differences in results of DI 'at the present' will be discovered during the symposium and will be the focus of attention in the discussion by prof. dr. Liesbeth Kester; setting a research agenda 'for the future'.

Capturing the Complexity of Differentiated Instruction

Presenting Author: Trynke Keuning, University of Twente, Netherlands; **Co-Author:** Marieke van Geel, University of Twente, Netherlands

Providing differentiated instruction (DI) is regarded an important but complex teaching skill, which many teachers do not master or feel prepared for. In order to design professional development activities, a thorough description of this task is required. In order to depict the complexity of DI, a Cognitive Task Analysis (CTA) was performed in the context of primary school mathematics. In an iterative process, nineteen expert teachers and two groups of experts were consulted to identify and structure the skills and knowledge teachers need to adapt their education to the needs of their students. The resulting differentiation skill hierarchy is presented here, together with the knowledge required for differentiation. Furthermore, five underlying 'principles of differentiation' were identified, which all apply to the four chronological stages that are closely interrelated. Based on the insights of this CTA, professional development trajectories can be designed, and teacher training programs can be redesigned in order to prepare teachers for this challenging task.

Measuring pre-service teachers' perceptions and actions of differentiated instruction

Presenting Author: Júlia Grifol Freixenet, Vrije Universiteit Brussel (VUB), Belgium; **Co-Author:** Wendelien Vantieghem, Vrije Universiteit Brussel, Belgium; **Co-Author:** Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium

Differentiated Instruction (DI) is considered both a philosophy and a practice of teaching (Tomlinson, 2014). Despite the popularity of DI among teachers, little research has been conducted to evaluate the effectiveness of the DI-model. In the same line, there are currently no instruments that specifically assess pre-service teachers' philosophy and self-reported practices on DI. To bridge this gap, we selected and adapted a previous validated instrument; the DI-QUEST (Coubergs et al., 2011) aimed at measuring teachers' perceptions and practices of DI. The instrument was adapted and validated with 1549 secondary pre-service teachers with more than two weeks of teaching experience. To reach our goal, principal component analysis was undertaken to investigate the five structure of the questionnaire. The best-fitting solution showed that DI perceptions consisted of two factors related to the pre-service teachers' philosophy of DI: growth mindset ($\alpha=0.789$) and ethical compass ($\alpha=0.769$), and three other factors related to DI teaching practices: flexible grouping ($\alpha=0.826$), output=input ($\alpha=0.753$) and differentiated instruction ($\alpha=0.842$). It was found that both DI philosophy and practices are needed for pre-service teachers to differentiate accordingly to three types of differences in learning (students' interests, readiness and learning profile) during their field experiences. This research also discusses the implications for teacher educators, teachers and researchers.

What factors can influence teachers' use of differentiated instruction?

Presenting Author: Marcela Gerardina Pozas Guajardo, Universität Trier, Germany; **Co-Author:** Christoph Schneider, University of Trier, Germany

The increasing in-class heterogeneity amongst students has inherently changed the demands placed on teachers. Differentiated instruction (or 'within-class differentiation' in Germanic languages) is an effective mean through which teachers can effectively deal with the different learning requirements and ensure that every student experiences meaningful and successful learning. There is extensive scientific literature and diverse theoretical frameworks on DI, however, most research exploring how teachers enact DI practices is mostly descriptive, focusing mainly on whether teachers apply differentiation practices at all, or on the practices they consider to be more practical (Smit & Humpert, 2012). As a consequence, little is known on the variables that influence the specific DI practices teachers implement, and whether, such patterns of influence varies across subjects domains. Using data from the National Educational Panel Study (NEPS), this study examines variables that might predict teachers' use of differentiated practices. The sample consisted of 5,286 ninth grade German and Math teachers. It was stratified according to school-tracks within the German school system. Results from multiple linear regressions indicate that teachers' reported feeling of preparedness, as well as teacher collaboration, were consistent predictors of the use of all DI-practices. Moreover, results show variation patterns across the subjects of German and Math. In contrast to German teachers, Math teachers use DI practices with the objective of fostering students' self-confidence and social competence. Besides contributing to the ongoing research, the results in this study highlight the need of quality training on DI practices and fostering constructive teacher collaboration within schools.

Differentiated instruction in primary and secondary schools: From noticing to adapting teaching

Presenting Author: Katrien Struyven, Hasselt University / Vrije Universiteit Brussel, Belgium; **Co-Author:** Esther Gheysens, Vrije Universiteit Brussel, Belgium; **Co-Author:** Els Consuegra, Vrije Universiteit Brussel, Belgium; **Co-Author:** Nadine Engels, Vrije Universiteit Brussel (VUB), Belgium

Differentiated Instruction (DI) is put forward as a mean to create more inclusive classrooms. Although favoured in theory, empirical studies reveal several

challenges when teachers implement DI. Building on the concept of professional vision, this study hypothesizes that teachers' competences of DI is connected to their ability to notice and to reason about inclusive teaching practices. In the methodology, two instruments are used: the e-PIC videography tool, that maps teachers their noticing and reasoning, and the DI-Quest that measures the teachers' self-reported beliefs and practices of DI. Exploring teachers' professional vision about inclusive teaching practices, this study found two similar groups in both primary and secondary education. The first group of teachers have strong noticing abilities. When judging, they gave high importance to arguments such as flexible grouping, active learning, adaptive teaching and instructional clarity. The second group of teachers showed higher misfit scores and give considerably less importance to the related reasoning arguments. When relating this profile to the self-reported beliefs and practices of DI remarkable predictive evidence is found. The study reveals that teachers' competences to create inclusive classrooms is dependent on their ability to notice inclusive teaching features of learning environments with plausible consequences for the implementation of DI.

Session S 2

16 August 2019 10:15 - 11:45

Lecture Hall - H09

Symposium

Motivational, Social and Affective Processes

Dimensional Comparisons Through the Lens of the Generalized I/E Model: Recent Developments

Keywords: Achievement, Attitudes and beliefs, Educational Psychology, Emotion and affect, Metacognition, Motivation, Motivation and emotion, Quantitative methods

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Christoph Niepel, University of Luxembourg, Luxembourg

Organiser: Christoph Niepel, University of Luxembourg, Luxembourg

Discussant: Anna-Katharina Praetorius, Institut für Erziehungswissenschaft, Switzerland

The generalized internal/external frame of reference (I/E) model highlights the importance of dimensional comparison processes in the formation of motivational constructs and self-perceptions across multiple school subjects. The present symposium puts forward four studies that applied the generalized I/E framework to advance our knowledge on dimensional comparisons processes. In the first contribution, the authors examined whether and to what extent assimilation and contrast effects of dimensional comparisons occur when inspecting achievement relations with domain-specific self-concepts, interests, and anxieties across three domains. Continuing with the construct of anxiety, the authors of the second contribution employed a nested modelling approach to examine dimensional comparison effects from achievement to general-school as well as to highly domain-specific aspects (specified as nested factors) of test anxiety across four domains. Anxiety was operationalized with two distinct facets: worry and emotionality. In the third contribution, the authors embedded temporal comparison processes into the generalized I/E framework (resulting in the so-called 2I/E model) and examined the effect of subject similarity on dimensional comparison across four domains. Furthering the investigation into the role of subject similarity in dimensional comparisons, the authors of the fourth contribution took a longitudinal perspective and examined the effect of subject similarity on dimensional comparisons in the formation of domain-specific self-concepts across four domains in three consecutive school years. Finally, our discussant will review the contributions against the background of dimensional comparison theory and research on motivational constructs and self-perceptions.

Assimilation and Contrast Effects of Dimensional Comparisons in Self-Concepts, Interests & Anxieties

Presenting Author: Lindie van der Westhuizen, University of Luxembourg, Luxembourg; **Co-Author:** Katrin Arens, German Institute for International Educational Research / DIPF, Germany; **Co-Author:** Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:** Antoine Fischbach, University of Luxembourg, Luxembourg; **Co-Author:** Christoph Niepel, University of Luxembourg, Luxembourg

Research on the internal/external frame of reference (I/E) model has frequently found contrast effects of dimensional comparisons (a negative relationship between achievement and self-concept across domains) between math and verbal domains. The generalised internal/external frame of reference (GI/E) model extends the I/E model to multiple domains including multiple languages and to other academic self-beliefs and attitudes. When considering multiple languages, achievement-self-concept relations across languages have been found to be either negative (contrast effect), positive (assimilation effect), or non-significant. The present study contributes to the ongoing debate concerning the effect of dimensional comparisons among languages by (1) examining dimensional comparisons across two languages and (2) extending the examination to interest and anxiety as outcome variables beyond self-concept. We analysed domain-specific self-concepts, interest, anxieties, and achievement regarding French, German and math in a representative sample ($N=5,789$) of Luxembourgish ninth-graders. Findings indicated (1) clear contrast effects in the formation of self-concept and interest in German, French and math, and (2) a combination of contrast, assimilation and/or no effects in the formation of anxiety in math, German, and French. With regard to the latter, contrast effects were found for achievement-anxiety paths from German to French, French to German, and French to math. Achievement-anxiety paths from math to French and German to math were non-significant, while the path from math achievement to German anxiety showed a small, yet significant assimilation effect. Results are contextualised within the multilingual Luxembourgish educational system and implications for research on dimensional comparisons are discussed.

Dimensional Comparison Effects on Facets of Subject-Specific Anxieties: A Nested Modelling Approach

Presenting Author: Irma Talic, University of Luxembourg, Luxembourg; **Co-Author:** Jörn Sparfeldt, Saarland University, Germany; **Co-Author:** Jens Möller, University of Kiel, Germany; **Co-Author:** Samuel Greiff, University of Luxembourg, Luxembourg; **Co-Author:** Christoph Niepel, University of Luxembourg, Luxembourg

The present study applied the generalized internal/external frame of reference (GI/E) model to examine social and dimensional comparison effects on the formation of two distinct facets of test anxiety (i.e., worry and emotionality) across four subjects (math, physics, German and English). In the present study, we analyzed the relations of subject-specific achievements (i.e., grades) on general and subject-specific anxieties in a nested-factor model to gain insight into dimensional (contrast and assimilation) effects across four subjects while controlling for levels of general anxieties. To this end, we drew on $N=386$ students attending Grade 9 and 10 in six academic track schools from four German federal states. Analyses were performed using structural equation modelling in Mplus8. The nested-factor model that was specified to separate general from subject-specific components of the anxiety facets showed a good fit to the data ($CFI=.956$, $RMSEA=.042$, $SRMR=.051$). Social comparison effects, as indicated by negative within-subject relations, were found in all subject-specific emotionality facets and in all subject-specific worry facets except for German. Dimensional comparisons revealed only as contrast effects (versus assimilation effects), indicated by positive cross-subject relations between math achievement and physics worry as well as physics, German and English emotionality; physics achievement and English emotionality; and German achievement and math emotionality. Math achievement was further negatively related to both general worry and general emotionality. Our findings provide evidence for the occurrence of dimensional contrast (but not assimilation) effects primarily in emotionality (as opposed to worry).

Testing the Effect of Subject Similarity on Dimensional Comparison Effects in the 2I/E Model

Presenting Author: Fabian Wolff, University of Kiel, Germany; **Co-Author:** Jens Möller, University of Kiel, Germany

Recent research on the generalized I/E model mainly found support for the core assumption of dimensional comparison theory that dimensional comparison effects are stronger between dissimilar subjects than between similar subjects. However, this research ignored that students form their academic self-concepts not only by social and dimensional, but also by temporal comparisons. To test the effect of subject similarity on dimensional comparison effects while considering social, dimensional, and temporal comparisons, we conducted the first study testing the newly developed 2I/E model including four subjects (math, science, English, German) within a sample of around 14,000 German eight-graders. In line with prior research on the 2I/E model, we found strong social comparison effects and small temporal comparison effects on students' domain-specific self-concepts for all subjects. The dimensional comparison effects between dissimilar subjects were small to moderate negative and, most importantly, more negative than the dimensional comparison effects between similar subjects, which were close to zero or even small positive. Our findings have at least three central implications: Firstly, they corroborate the assumption of

dimensional comparison theory that dimensional comparison effects vary as a function of subject similarity even if dimensional comparison effects are examined within a more comprehensive framework considering social, dimensional, and temporal comparisons. Secondly, they provide further support for the generalizability of the 2/E model to other subjects. Finally, they imply that teachers can foster their students' domain-specific self-concepts by emphasizing both students' achievement improvements and students' better achievements in similar subjects.

The Role of Domain Similarity in the Longitudinal Interplay Among Achievement and Self-Concept

Presenting Author:Fabio Sticca, Marie Meierhofer Children's Institute, Switzerland; **Co-Author:**Thomas Goetz, University of Konstanz, Germany; **Co-Author:**Richard Shavelson, Stanford University, United States; **Co-Author:**Franz Eberle, University of Zurich, Switzerland; **Co-Author:**Jens Möller, University of Kiel, Germany

The aim of the present study was to examine whether students' subjective judgment of the similarity between two academic domains moderated cross-sectional and longitudinal between-domain effects of achievement on self-concept and vice versa. Based on the generalized reciprocal internal external frame of reference model and dimensional comparison theory, it was assumed that between-domain effects would decrease in magnitude with increasing levels of subjective domain similarity. A sample of 756 (T1, 43.5% female), 554 (T2, 44.2% female), and 474 (T3, 43.9% female) German speaking high-school students (mean age at T1 = 15.6 years) from eight REGIONS in COUNTRY reported on their academic self-concept in mathematics, German (native), French, and English on three consecutive school years. Students also reported on their subjective domain similarity between all six possible pairs of academic domains. Actual midyear grades were reported by school administrations. Results of structural equation models showed that the subjective domain similarity attenuated the effect of achievement in one domain on self-concepts in another domain (i.e., positive moderation of a negative main effect) in cross-sectional models. However, no longitudinal moderating effect of subjective domain similarity was found neither for the effect of achievement in one domain on self-concepts in another domain nor vice versa. These findings suggest that subjective domain similarity moderates the between-domain effect of self-concept on achievement in the short term only, which indicates that these moderating effects are not strong enough to buffer negative between-domain effects in the long term. Implications for educational research and practice are discussed.

Session S 3

16 August 2019 10:15 - 11:45

Seminar Room - S10

Symposium

Lifelong Learning

Assessing teachers' knowledge, beliefs, and self-efficacy about promoting SRL

Keywords: Assessment methods and tools, Attitudes and beliefs, Educational Psychology, Metacognition, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Charlotte Dignath, Goethe-University Frankfurt, Germany

Discussant: Anat Zohar, Hebrew University, Israel

Research on teacher competence has indicated that teachers' classroom practice can be predicted by teachers' knowledge, their beliefs, their motivation, and their own self-regulation (e.g., Kunter & Baumert, 2013). Converting such a framework to the field of teachers' competence to promote self-regulated learning (SRL) has revealed that teachers' self-reported SRL practice is affected by their beliefs and their self-efficacy to support SRL, as well as their SRL knowledge (Dignath, 2016). Nevertheless, SRL research has only very recently started to address aspects of teacher competence, and valid assessment instruments are scarce.

This symposium aims to bring together research that reports on the development and application of new instruments measuring teachers' knowledge, beliefs, and self-efficacy in the context of fostering SRL. The first study reports on the structure of teachers' belief systems about promoting SRL, assessed with a new beliefs questionnaire. In the second study, the construction and validation of a questionnaire to measure teachers' self-efficacy towards promoting SRL in the classroom are presented. The third study introduces a new video tool to assess teachers' knowledge about SRL. In the fourth study, a newly constructed knowledge multiple choice test is applied and the outcomes are related to teachers' diagnostic and coaching skills.

This collection of papers provides new insights into the structure of teachers' knowledge, beliefs, and self-efficacy in the context of supporting SRL that can inform future research in the field. Moreover, the studies present recently developed assessment instruments that can serve SRL research.

Pre-service Teachers' Belief Systems with Respect to the Self-Regulation of Learning

Presenting Author:Stella Vosniadou, Flinders University, Australia; **Co-Author:**Michael Lawson, Flinders University, Australia; **Co-Author:**Mirella Wyrta, Flinders University, Australia; **Co-Author:**Penny Van Deur, Flinders University of South Australia, Australia; **Co-Author:**David Jeffries, College of Education, Psychology and Social Work, Flinders University, Australia

The predictors of pre-service teachers' beliefs in the promotion of self-regulated learning in the classroom were investigated using structural equation modeling. The model with the best fit showed that beliefs in the teaching of self-regulation strategies in the classroom were predicted by beliefs that self-regulation strategies improve student achievement. Beliefs in constructive learning were predictors of beliefs in the teaching of self-regulation strategies as well as of beliefs that the main goal of teaching is to transmit subject matter knowledge. The results also showed a high degree of overlap between conflicting beliefs, namely beliefs that teaching involves the transmission of subject knowledge and beliefs in the importance of teaching strategies. We argue that more attention should be paid to pre-service (and practicing) teachers' beliefs regarding (a) how self-regulation strategies can help students acquire subject matter knowledge, and (b) how self-regulation strategies are linked to student achievement.

Teachers' diagnostic and coaching skills in self-regulated learning Do beliefs and knowledge matter?

Presenting Author:Yves Karlen, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland; **Co-Author:**Carmen Hirt, University of Applied Sciences and Arts Northwestern Switzerland (FHNW), Switzerland; **Co-Author:**Silke Hertel, Ruprecht-Karls-Universität Heidelberg, Germany

Self-regulated learning (SRL) has a positive effect on students learning and academic success. In addition to promoting SRL explicitly and implicitly in classroom, diagnosing students' learning behaviours and facilitating learning through individual coaching are fundamental tasks that teachers must accomplish in the context of SRL. This study seeks to examine teachers' knowledge and beliefs about SRL and assess their predictive value towards teachers diagnostic competences and competences in facilitating learning through individual coaching in SRL. Sixty-four teachers (in-service n=28, pre-service n=38) completed self-report questionnaires on beliefs about the malleability of SRL, beliefs about students' capability of SRL and their self-perceived competences in diagnosing and coaching students SRL. In addition, teachers were required to complete a newly developed multiple-choice test about SRL knowledge and scenario-based tests with multiple-choice answers about diagnostic and learning counselling competencies. The results show that teachers rated SRL as rather malleable, positively judged their students' capability of SRL, and were quite confident in diagnosing SRL and coaching students in the context of SRL. Teachers' beliefs about the flexibility of SRL were a positive predictor for diagnostic and coaching competences. Further, teachers' self-perceived competences in diagnosing SRL were a negative predictor of teachers' diagnostic competences. Teachers' knowledge about SRL predicted teachers' diagnostic competencies only. Overall, the results of this study demonstrate how teacher beliefs and knowledge regarding SRL positively correlate with teachers diagnostic and counselling competencies.

Development and validation of the teacher self-efficacy scale to implement self-regulated learning

Presenting Author:Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Mona De Smul, University of Ghent, Belgium; **Co-Author:**Sofie Heirweg, Ghent University, Belgium; **Co-Author:**Geert Devos, Ghent University, Belgium; **Co-Author:**Sabrina Vandeveld, Ghent University, Belgium

This paper describes the development of a self-report instrument: the Teacher Self-Efficacy Scale to implement Self-Regulated Learning (TSES-SRL). This instrument measures teachers' perceived ability to integrate activities promoting self-regulated learning in classroom practice as a specific instructional domain.

Such a teacher self-efficacy scale is currently missing in the SRL research field. The process of the item and scale development is presented. Exploratory factor analysis suggests a four-factor structure. Next, confirmatory factor analysis was performed and goodness of fit estimates were calculated, indicating an acceptable fit. Furthermore, this instrument also shows noticeable differences in results from a more general teacher self-efficacy scale, which shows us that the process of teaching self-regulated learning is different from more general classroom instruction and corroborates the use of a specific measure. Overall, the TSES-SRL is considered a useful instrument to measure teachers' feelings of competence regarding SRL implementation.

Assessing teachers' knowledge about self-regulation during learning

Presenting Author:Charlotte Dignath, Goethe-University Frankfurt, Germany; **Co-Author:**Max Seidel, Goethe-University Frankfurt, Institute of Psychology, Germany; **Co-Author:**Mareike Kunter, Goethe-Universität Frankfurt, Germany

Very little research has been conducted to date that serves to assess teachers' knowledge about self-regulation of students and to our knowledge no instrument exists that measures in how far teachers can detect self-regulatory skills in children. In order to close this gap, this test construction study investigated whether two videos showing a child during task execution are distinct enough to elicit different classification of self-regulation among teachers. The staged videos showed a nine-year old working on the Train Track Task (TTT; Bryce & Whitebread, 2012), an observational method designed to assess self-regulation skills in children by coding their verbalizations and non-verbal behavior during a problem-solving task.

We investigated whether teachers classify the verbal and non-verbal behavior of the videotaped child correctly with regard to self-regulation, and whether teachers justify their classification correctly by finding correct examples that indicate the presence or absence of self-regulation. The results demonstrated the discriminatory power of the video material by showing that teachers differed significantly in their estimation of self-regulation as a function of the video that they had watched. Moreover, the results revealed that teachers' identification of missing self-regulation was affected by their prior experience with assessing self-regulation among their students. The study indicates that using video tools can be a promising way to assess teachers' knowledge of self-regulatory skills in children.

Session S 4

16 August 2019 10:15 - 11:45

Lecture Hall - H08

Symposium

Motivational, Social and Affective Processes

Functions of Relational Quality for Learning, Teaching, and Learning to Teach

Keywords: At-risk students, Educational Psychology, Emotion and affect, Motivation and emotion, Social aspects of learning and teaching, Teaching approaches

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Paul Swan, Monash University, Australia

Organiser: Charlott Rubach, University of Potsdam, Germany

Organiser: Paul Swan, Monash University, Australia

Organiser: Ji Hong, University of Oklahoma, United States

Organiser: Gerda Hagenauer, University of Salzburg, Austria

Discussant: Diana Raufelder, University Greifswald, Germany

This symposium brings together international research on teacher-student relationships and their effects in shaping teacher-student relationships, engagement, and performance. Researchers from diverse contexts (Germany, Australia, the United States, and Switzerland) investigate important antecedents, characteristics, and consequences of teacher, pre-service teacher, and student relational quality in primary and secondary classrooms. Paper 1 (Germany) considers the effects of perceived social support on adolescent depression and deviance, student adjustment and academic success in secondary school. Paper 2 (Australia) explores case studies of teacher-student relationships, manifestations of empathy practice in primary schools, and identified teacher characteristics that reflect empathy and an ethic of care in interactions with students. Paper 3 (United States) considers teacher empathy dispositions in a U.S. urban elementary school with a large, low socio-economic status (SES), and dominantly Hispanic student population. Teacher attribution beliefs and role identity are examined to contrast different teacher dispositions: empathy, sympathy, and indifference. Paper 4 (Switzerland) considers relational quality in teaching internship, characteristics of quality relationships, and how relationships develop over time. Together, their educational significance is to provide insight into teacher motivations and practice elements in teacher-student relationships and relational quality in cross-cultural classrooms. The Discussant expert commentary will highlight major contributions and particularities, pose fruitful directions for further research, and consider implications for teacher-student relationships and relational quality.

The significance of parents' and teachers' social support for students' depression and deviance

Presenting Author:Denise Kücholl, Schulpädagogik Universität Potsdam, Germany; **Co-Author:**Charlott Rubach, University of Potsdam, Germany; **Co-Author:**Anna-Lena Dicke, University of California, United States; **Co-Author:**Rebecca Lazarides, University of Potsdam, Germany; **Co-Author:**Sandra Simpkins, University of California, United States; **Co-Author:**Jacquelynn Eccles, University of California, United States

Depression and deviant behavior can have a negative effect on students' academic success (Keyes, 2006; Verboom et al., 2014). Social support is one potential antidote for the development of depression and deviant behavior. Using Expectancy-Value theory (Eccles et al., 1983) as a theoretical backdrop, this study focused on the differential effects of the perceived social support from mothers, fathers, and teachers on adolescents' depression and deviance during adolescence. We also examined to what extent these relations differed for male and female students. For this study, we used data from two cohorts from the Childhood and Beyond Study. The first cohort included N = 169 students (55.6 % girls) in ninth and tenth grade. The second cohort included N = 303 students (53.1 % girls) from tenth to twelfth grade. Using manifest path models and cross-lagged analyses, results indicated that only the perceived social support of the mother and teachers was associated with lower students' depression in different phases of adolescence. Differential gender effects were found: The perceived social support of the mother in ninth grade led to a lower depression in tenth grade for males, but not for female students. For female students, the perceived social support of teachers in ninth grade led to lower depression in tenth grade. In summary, this study was able to demonstrate that social support from mothers and teachers can be seen as a resource for reducing depression and deviant behavior in order to ensure an adaptive development of learning and well-being in adolescence.

Teacher relational quality and manifestations of empathy in Australian primary classrooms

Presenting Author:Paul Swan, Monash University, Australia

This study explored how everyday displays of teacher empathy affected student learning and welfare outcomes, as well as teacher wellbeing. Its aim was to analyse how Australian primary teachers deemed as effective empathisers establish, build and maintain relationships with students and create supportive learning environments. Effective teacher empathy involves recognizing a student's mental state (intentions, beliefs, desires, and emotions) and responding with an appropriate emotion based on care. The study explored teachers' lived experience using a blend of methods. Teacher reports of their relational goals and teaching style dimensions, together with student-rated parallel teaching style dimensions, complemented filmed classroom practice with self-identified positive "empathy interaction moments". These vignettes and "live" lessons were coded for levels of emotional support using the Classroom Assessment Scoring System. Teachers' perspectives of their actions in vignettes were explored at interview and thematically analysed using an interpretative phenomenological approach. High correlations for the CLASS emotional support dimensions were identified between lesson observations and vignettes. Strong alignment between teachers' and students' perceptions of teaching style dimensions was also evident. Empathic teachers were highly motivated to connect with students, took a personal interest beyond curriculum demands, displayed high levels of support, and regulated their teaching style to meet student needs. A practical outcome

grounded in this data is an empathy assessment instrument, that could be used as a platform to embed specific empathy experiences in the classroom and enhance teachers' empathic engagement.

Various Dispositions of Teacher Empathy in Culturally Diverse Classrooms

Presenting Author:Ji Hong, University of Oklahoma, United States; **Presenting Author:**Dionne Cross Francis, Indiana University, United States; **Co-Author:**Crystal Neill, The University of Oklahoma, United States; **Co-Author:**Laura Lewis, The University of Oklahoma, United States; **Co-Author:**Alexandra Parsons, The University of Oklahoma, United States; **Co-Author:**Qian Wang, The University of Oklahoma, United States

Teacher empathy has been recognized as a key disposition that is necessary for teachers, especially those who teach in racially, ethnically, and linguistically diverse classrooms. The purpose of this study is to compare and contrast different empathy disposition of teachers who teach in an urban elementary school with a large, low socio-economic status (SES), and dominantly Hispanic student population. Twenty-four teachers participated in individual, semi-structured interviews. Findings showed three different dispositions: (1) Empathy disposition that included empathetic concerns, understanding of students' background, and concrete actions to alleviate students' distress, (2) Sympathy disposition that showed surface level affective responses without perspective taking and understanding of students' cultural differences, and (3) Indifference disposition meaning teachers were critical of students' backgrounds, blamed parents, or were uninterested in students' backgrounds. Also teachers' attribution beliefs (locus of control) seemed to be associated with these different empathy dispositions. Given this finding, implications for teacher educators and professional developers were addressed.

Developing relational quality for student teachers and mentors in the pedagogical internship

Presenting Author:Gerda Hagenauer, University of Salzburg, Austria; **Co-Author:**Jennifer Waber, University of Bern, Switzerland; **Co-Author:**Lea de Zordo, University of Teacher Education Bern, Switzerland

Based on the theoretical assumption that positive secure relationships are of core relevance for optimal human functioning (Baumeister & Leary, 1995), it can be assumed that such relationships are also relevant in the context of learning to teach. However, the quality of relationships in the pedagogical field experience and how these relationships develop over time is still a neglected field in research. One significant relationship in this context is the relationship between the student teacher and the mentor teacher. This is where the present research steps in: Based on qualitative interviews with 27 Swiss students studying teacher education, the study explores how relationships between student teachers and their mentor teacher(s) develop during the pedagogical internship by placing a particular interest on so-called "relational turning point events" in this process of relationship formation. It furthermore explores the constitutive elements of high quality relationships between student teachers and their mentor teacher(s) from the students' perspective. The results show that positive relational turning point events, for example, as reflected by moments of disclosure and appreciation, strengthened the student teacher/mentor teacher relationship, while negative relational turning points events, such as moments of ambiguity and violated trust, led to a greater distance and an increase in alienation in this relationship. With regard to the constitutive elements of positive relationships between student teachers and their mentor teacher(s), student teachers emphasize the degree of professionalism of the mentor teacher (e.g. fairness, transparency) as well as the appreciation and acceptance demonstrated in the mentor-student interaction.

Session S 5

16 August 2019 10:15 - 11:45

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Assessment and Evaluation, Instructional Design

Applications of Effective Learning Strategies in Educational Practice

Keywords: Assessment methods and tools, Computer-assisted learning, Educational Psychology, Experimental studies, Higher education, Instructional design, Metacognition, Quantitative methods, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 06 - Instructional Design

Chairperson: Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands

Organiser: Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands

Discussant: Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands

A number of recent review studies (e.g., Dunlosky et al., 2013) indicate that learning strategies such as distributing practice over multiple sessions and actively retrieving studied information from memory have high utility for learning. However, both students and teachers are often not aware of this benefit (e.g., Morehead, Rhodes, & DeLozier, 2016). Also, many of the studies supporting the utility of these strategies were performed in the laboratory, often using artificial materials and in controlled environments. In the past decade, there has been an increase in research on applications of these learning strategies in real-life classroom situations. The four studies that will be presented in this symposium are all examples of applications of retrieval practice and distributed practice in educational practice. The aim of these studies was to both inform theory and provide guidelines for successful application of these strategies in various domains, among which are student support in using effective study strategies (paper 1), effective summative and formative assessment using retrieval practice and distributed practice (paper 2 & 3), and optimal distribution of revision sessions (paper 4).

Supporting Students' Application of Learning Strategies

Presenting Author:Tino Endres, University of Freiburg, Germany; **Co-Author:**Cornelius Böttger, Justus-Liebig-Universität Giessen, Germany; **Co-Author:**Alexander Renkl, University of Freiburg, Germany

To support students' application of their own learning strategies, we developed a computer-based online training for freshmen students in a developmental psychology course. This environment consists of two modules: 1) teaching declarative knowledge about learning strategies and 2) supporting students to apply these learning strategies when working for the university course. We conducted several experimental studies to optimize this learning environment with respect to how the declarative & meta-knowledge about learning strategies can be effectively consolidated and how the formation of prompts for applying the learning strategies can be sensibly supported. For consolidating students' knowledge about learning strategies, a retrieval practice-based arrangement is best that uses different types of test questions for learners with different levels of prior meta-knowledge. This meta-knowledge is automatically assessed in the learning environment. We found that it is important to support students to apply their recently learned strategies. We found two effective ways: the established way to provide them with instructional prompts or to support them in formulating Implementation Intentions on their own.

Guidelines for Effective Use of Formative Tests in the Classroom

Presenting Author:Kim Dirkx, Open University, Netherlands; **Co-Author:**Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:**Desirée Joosten-ten Brinke, Open University of the Netherlands, Netherlands

Quizzes and practice tests are more and more widely used in education as they have shown to be beneficial for learning. However, there are no clear guidelines for designing such intermediate tests, which limits the possible effectiveness of practice testing in educational practice. However, memory research on effective learning strategies in the past decade has yielded useful results that could inform, for example, the most optimal testing format and the optimal distribution between tests for learning. The link between research on practice testing and testing as effective learning strategy (i.e., retrieval practice or testing-effect) has thus far not been thoroughly made. In this review study, our aim was to combine both research paradigms and formulate concrete and well-founded guidelines for the design of practice tests to be used in the classroom.

The Role of Material Complexity and Learner Ability on Determining the Optimal Learning Schedule

Presenting Author:Carolina Kuepper-Tetzl, University of Dundee, United Kingdom

Repetition is key for learning and increasing understanding of a topic. In order to build a strong knowledge base of the material taught in class, students need to spend time revising it and teachers need to reiterate on it. The question is: When should these revision sessions be optimally planned across the semester? In this talk, an overview of factors that influence the optimal way to distribute study sessions will be provided by shedding light on the cognitive processes that

contribute to beneficial learning schedules. A summary of empirical findings of the learning phenomenon of *distributed practice* – the memory benefit of distributing a fixed amount of study time across learning sessions instead of massing it into one learning episode – will be given in this talk. Most importantly, a new line of research will be presented that looked into the roles of material complexity and learner characteristics for the optimal scheduling of learning sessions. Using a combination of lab and field experiments, we find evidence that the optimal time to reengage with the to-be-learned materials depends on material complexity as well as student abilities (i.e., verbal comprehension ability). On the backdrop of this new empirical evidence, the talk will conclude with concrete guidelines for education and with implementation ideas for teachers and students.

Comparing Formative and Summative Cumulative Compensatory Assessment in an Engineering Course

Presenting Author: Peter Verkoijen, Erasmus University Rotterdam, Netherlands

Procrastination can be defined as irrationally delaying the start or completion of an intended action and it is extremely prevalent in higher education. Procrastination is assumed to have a negative influence on learning because it is associated with the use of suboptimal learning strategies. Recently, summative cumulative compensatory assessment has been proposed to battle procrastination. This approach aims to stimulate students to use effective learning strategies, most notably retrieval practice and distributed practice. In the present study, we compared a formative and a summative variant of cumulative compensatory assessment on end-of-course performance. To address this question, two field experiments were conducted in a higher-education engineering course. In both experiments, students were randomly assigned to a summative cumulative compensatory assessment (SCCA) condition and a formative cumulative compensatory assessment (FCCA) condition. Both conditions were compared on the end-of-course exam and on a delayed test. Furthermore, in Experiment 2, preparation time for each assessment and end-of-course exam self-efficacy were measured. In both experiments, the mean end-of-course exam grade did not differ significantly between the two conditions. A small-scale random effects meta-analysis, showed a combined, non-significant meta-analytic SCCA advantage of 0.35 [95% CI -0.04; 0.75] on a 10-point scale, which corresponds to a small effect in terms of Cohen's *d*. Furthermore, Experiment 2 failed to show significant differences between the SCCA and the FCCA in cumulative assessment preparation time and end-of-course exam self-efficacy. These findings suggest that in the present context, formative assessment did not present a stronger behavioral incentive than summative assessment.

Session S 6

16 August 2019 10:15 - 11:45

Lecture Hall - H05

Symposium

Cognitive Science

Inhibitory abilities and academic performance: new measurement and analytical approaches

Keywords: Achievement, Cognitive development, Cognitive skills, Educational Psychology, Mathematics, Metacognition, Neuroscience, Quantitative methods, Self-regulation

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Kerry Lee, The Education University of Hong Kong, Hong Kong

Discussant: Grégoire Borst, France

Most of us have found ourselves trying to read a journal paper, only to be defeated by an inability to suppress intruding thoughts. It is commonly thought that children are even more susceptible to being distracted. In a noisy classroom environment with multiple conversations occurring at the same time, it is remarkable that children can concentrate at all. These anecdotes serve as illustrations of expectations on the relation between inhibitory abilities and performance. However, empirical findings on this relation have been mixed (Bull & Lee, 2014; c.f., Cragg & Gilmore, 2014). In a recent paper Lee and Lee (2018) argued that the inconsistencies may be due to poorly constructed or selected inhibitory measures, measures of academic performance that require little inhibitory resources, or poor analytical methods. In this symposium, we present four studies that provide further insight on each of these concerns. The first paper examines the use of error monitoring, quantified as post-error slowing, as a supplementary or alternative index of inhibitory abilities. The second paper also focuses on the measurement of inhibitory abilities and presents findings from a task that capitalises on intuition regarding the relation between area and length of perimeter. The third paper focuses on mathematical performance and tests the hypotheses that pattern of findings will differ depending on the domain of mathematics being tested and children's knowledge in that domain. The last paper focuses on analytical methods and shows that in the context of longitudinal data, different statistical models can result in very different findings.

Kindergarteners' error monitoring in the context of a classical inhibition task

Presenting Author: Claudia Roebers, University of Bern, Switzerland

From a theoretical perspective, error monitoring is considered an integral part of inhibitory control skills. Error monitoring is quantified in terms of post-error slowing in classical tasks of inhibition, measured as slower reaction times following an error compared to reaction times following a correct response in a multiple trial inhibition task. In this contribution, kindergarten children's ability to detect errors, and adjust their speed of responding will be examined. We will address children's response latencies of correct, incorrect, post-error, and post-correct responses in a newly developed, child-friendly, multiple-trial, computerized task executed with tablet computers. Results provide strong evidence of substantial and relative efficient error monitoring: children slowed down their responses after committing an error, and this post-error slowing was significantly related to overall task performance. Detailed analysis also showed that incorrect responses were given at a higher speed than correct responses, suggesting that too fast responding on the level of single trials is at least in part responsible for inhibition deficits in young children. The findings will be discussed in the context of a more comprehensive understanding of inhibition, how it may play a role for developmental progression in inhibition, as well as its relation to metacognitive monitoring, a concept with substantial impact on academic performance.

Inhibitory abilities in overcoming intuitive interference

Presenting Author: Reuven Babai, Tel Aviv University, Israel; **Co-Author:** Nahed Younis, Tel Aviv University, Israel; **Co-Author:** Ruth Stavy, Tel Aviv University, Israel

Students encounter difficulties when solving problems that may stem from intuitive interference of salient irrelevant variables of the problem. We focused on the comparison of perimeters task, in which area is the irrelevant salient variable. In congruent trials (no interference; larger area – longer perimeter), accuracy is higher and reaction time is shorter than in incongruent trials (intuitive interference; larger area – shorter or equal perimeter). A brain-imaging study indicated that correctly answering the incongruent condition is associated with activation in the prefrontal brain area known for its inhibitory control. Moreover, the level of brain activation in this prefrontal region was correlated with success rate in incongruent trials. Here we further studied the involvement of inhibitory abilities in overcoming intuitive interference. The efficiency of inhibitory abilities of 90 ninth graders was assessed and their accuracy and reaction time in the comparison of perimeters task were recorded. Findings showed that students with efficient inhibitory abilities scored significantly better in incongruent trials than did those with inefficient ones. In addition, findings indicated that the higher their inhibitory abilities, the better they were in overcoming the intuitive interference. These findings suggest the importance of inhibitory abilities in overcoming interference in science and mathematics. They point to the possibility of improving students' ability to overcome intuitive interference by strengthening their inhibitory control mechanisms. We also demonstrate that applying cognitive psychology and neuroscience methodologies in science and mathematics education research contributes to both fields.

Is inhibitory control related to individual differences in arithmetic?

Presenting Author: Bert De Smedt, KU Leuven, Belgium; **Co-Author:** Elien Bellon, KU Leuven, Belgium; **Co-Author:** Wim Fias, University of Ghent, Belgium

Various studies have linked inhibition to individual differences in mathematics achievement, but others have found that this association is only weak and inconsistent. We aimed to extend this research by addressing two of its limitations. Firstly, we focused on the association with one specific mathematical skill, i.e. arithmetic fluency, as in this domain, incorrect but competing answers need to be inhibited. Secondly, we tested the possibility that the association with

inhibition is time-limited and dependent on one's level of expertise in arithmetic, by investigating arithmetic operations in which children had extensive expertise (addition) and in which they were still in the learning phase (multiplication). Participants were 127 typically developing children that were longitudinally followed from grade 2 to grade 3. In each grade, all children completed the same set of tasks to measure their inhibition (Flanker task, Animal Stroop) and arithmetic (single-digit addition and multiplication) abilities. Our findings revealed that inhibition was significantly correlated with arithmetic. These associations were time-dependent. They changed according to the learning phase, i.e. they only occurred for those operations with extensive expertise, i.e. addition in grade 2 and addition and multiplication in grade 3. The observed associations, however, were only of a small to medium effect size, and no cross-lagged associations were found. These data question the role of inhibition as a strong candidate for the development of effective educational interventions to improve mathematics achievement.

A comparison of longitudinal approaches to the analysis of data on inhibition and math performance

Presenting Author:Kerry Lee, The Education University of Hong Kong, Hong Kong

Findings on children's inhibitory abilities and mathematical performances have not been conclusive (Bull & Lee, 2014; c.f., Cragg & Gilmore, 2014). A recent review suggests that method of analysis is at least partially to blame (Lee & Lee, in press). The subtraction method typically used to gauge susceptibility to interference is known to produce poor interitem reliability (Lord, 1958) and can result in lower estimates of association. I will present data from a four-wave longitudinal study in which children (N = 1524) were given tests of inhibitory abilities and a standardised mathematical test. The data were analysed using a traditional autoregressive-crosslagged model, a growth model (which provides measures of performance collapsed across measurement points), and an autoregressive-crosslagged model with structured residuals. The findings showed that the three models produced different conclusions. The autoregressive-crosslagged model suggest that both mathematical and inhibitory abilities are malleable with changes predictive of performance in subsequent years. They also suggest that performances across the two domains are not related. Both growth models suggest otherwise. They show that relation between inhibition and mathematics is strong but only when averaged across the four waves. Once variance attributable to factors that remain stable across time is controlled, variation in inhibitory abilities does not predict mathematical performance. These findings suggest that short-term intervention that improve inhibitory performance is unlikely to result in better mathematical performance. In contrast, changes to conditions that bring about long-term changes will likely bring benefits.

Session S 7

16 August 2019 10:15 - 11:45

Lecture Hall - H07

Symposium

Teaching and Teacher Education

The Naming of Classroom Phenomena - International Perspectives on Teachers' Professional Vocabulary

Keywords: Competencies, Conversation/ Discourse analysis, Higher education, Mathematics, Pre-service teacher education, Qualitative methods, Social aspects of learning and teaching, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Marita Eva Friesen, Ludwigsburg University of Education, Germany

Organiser: Siri-Malen Høyne, Norwegian University of Science and Technology (NTNU), Norway

Discussant: Synnøve Matre, Norwegian University of Science and Technology, Norway

Terms teachers use when describing and discussing classroom phenomena are profoundly important in shaping teaching and for enhancing reflection on practice. Moreover, learning and becoming familiar with this professional vocabulary is an important part of becoming initiated into the profession. This symposium explores this topic through studies of mathematics teachers' professional vocabulary in four different contexts and countries: Australia, Canada, Germany, and Norway. The lexicons of preservice and in-service mathematics teachers from Australia are reported and compared in the first study. In the second study, vocabulary used by Canadian preservice mathematics and generalist teachers in reflections and focus groups during and after an international practicum are analysed. The lexicon surrounding mathematical representations, an important concept for mathematics learning, and how it was used in mentoring conversations between preservice and in-service teachers during the practicum are the topic of the Norwegian study. Finally, a German study, also exploring mathematical representations, examines changes in preservice teachers' vocabulary after taking a course devoted to the analysis of these representations. The findings of each of these unique studies come together to inform teacher educators, across international contexts, about differences and similarities between preservice and in-service teachers' vocabulary, what teachers name and notice about their classrooms, the dynamics of mentorship and practicum experiences, and gaps as well as areas of growth. These results will provide valuable insight into how investigating teachers' professional vocabulary may advance the ongoing development of teachers. The symposium will encourage audience participation via an interactive app, sharing real-time questions and feedback.

A Comparison of Australian Preservice and In-service Teachers' Professional Vocabulary

Presenting Author:Carmel Mesiti, University of Melbourne, Australia; **Co-Author:**David Clarke, The University of Melbourne, Australia

This presentation draws on a project involving ten communities internationally. The researchers' primary goal is the documentation of the professional vocabulary employed by mathematics teachers to describe the phenomena of the middle school mathematics classroom. It is through their professional lexicon that teachers are able to reflect on and improve their practice. Single words or short phrases that are used with a consistent and agreed meaning were documented, operationalized with descriptions and examples, and validated both locally and nationally.

The 63 terms of the Australian lexicon were organised into five categories consistent with the groupings suggested by teacher practitioners: Administration (eight terms), Assessment (11 terms), Classroom Management (six terms), Learning Strategies (27 terms), and Teaching Strategies (50 terms). Survey responses from in-service (n = 155) and preservice (n = 62) teachers have contributed to the profiling of term familiarity for different sectors of the Australian mathematics education community including differentiation by level of experience. Their responses have provided an opportunity for critical reflection on the professional vocabulary of all teachers and offers possibilities that may help advance the professional and pedagogical lexical repertoire for the ongoing development of teachers.

Preservice Teachers' Professional Vocabulary: Reflections on International Practicum Experiences

Presenting Author:Karla Culligan, University of New Brunswick, Canada

This presentation explores the professional vocabulary of Canadian preservice teachers, at the elementary and secondary levels, as they engaged in reflective writing throughout an 8-week school-based practicum in China as well as follow-up focus group interviews. The theoretical framework of the research is built on sociocultural theory, including the notion that language is one of the most important cultural tools through which humans make meaning of their world. As for teachers (preservice and in-service alike), including teachers of mathematics, the vocabulary they use influences how they organize, categorize, and make sense of the social context of their classrooms. For preservice teachers, the teaching practicum is underscored as one of the most significant learning experiences in their education programs. Thus, data were collected from 28 preservice teachers' online reflective journals and focus group interview transcripts. Data were analyzed following qualitative methods in order to identify and understand participants' use of key lexical terms and/or phrases related to their professional classroom experiences. Results show that professional vocabulary related to several overarching themes: Culture, Schools, Teaching & Learning, Challenges & Highlights, and Expanding Worldviews. Regardless of specific classroom placement, that is, whether in a mathematics classroom or not, preservice teachers' vocabulary tended to centre on generalized classroom phenomena. Implications involving what preservice teachers notice in their classrooms, the importance of reflective practice, and the key role played by professional language, are discussed in conclusion.

Professional vocabulary used in mentoring conversations with preservice mathematics teachers

Presenting Author:Siri-Malen Høyne, Norwegian University of Science and Technology (NTNU), Norway

The International Classroom Lexicon Project has identified the lexicons in use by middle school teachers in various countries when describing events of the

mathematics classroom, and they claim that the practices teachers can name give an insight into what is valued. Inspired by this focus on professional vocabulary, in this paper I investigate the following question: What professional vocabulary is used in mentoring conversations about mathematics and the mathematics classroom? By analyzing preservice teachers and their mentors in two mentoring conversations during practicum I learned about the vocabulary in active use by the participants. The identified vocabulary falls into six categories; two categories involving terms associated with mathematical content, and four additional categories related to the mathematics classroom. Many of the terms used to talk about the mathematics classroom are general, but I will present examples of some that are specific to the mathematics classroom.

Preservice teachers' professional vocabulary changes when they learn to analyse classroom situations

Presenting Author:Marita Eva Friesen, Ludwigsburg University of Education, Germany; **Co-Author:**Carmel Mesiti, University of Melbourne, Australia; **Co-Author:**Sebastian Kuntze, Ludwigsburg University of Education, Germany

Analysing classroom situations in the sense of identifying and interpreting events that are relevant for student learning can be described as an essential aspect of teachers' professional competence. In line with the high relevance of how representations are dealt with in the mathematics classroom, we conducted a university course with mathematics preservice teachers specifically focused on learning to analyse the use of multiple representations in classroom situations. Although it is assumed that what teachers identify and interpret in classroom situations might not only be channelled by their knowledge but also by what they can name, research addressing the connection between teachers' professional vocabulary and their analysing of classroom situations is still very scarce. We were hence particularly interested in the professional vocabulary preservice teachers use and how such vocabulary changes when they learn to analyse classroom situations. In order to address our corresponding research questions, we collected 136 written analyses from 17 preservice teachers who were asked to evaluate the use of multiple representations in four classroom situations before and after a university course. The findings revealed that the preservice teachers' professional vocabulary improved with respect to breadth and specificity and that they used more terms related to essential aspects of theory on multiple representations after the course. As teachers' use of professional vocabulary appears to play a role with regard to their analysing of classroom situations, further research is encouraged to gain insight into corresponding competence development.

Session S 8

16 August 2019 10:15 - 11:45

Lecture Hall - H11

Symposium

Cognitive Science

Factors Influencing Source Preference and Evaluation When Dealing with Expert Knowledge

Keywords: Argumentation, Attitudes and beliefs, Comprehension of text and graphics, Experimental studies, History, Pre-service teacher education, Quantitative methods, Reasoning, Science education, Student learning

Interest group: SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Eva Thomm, University of Erfurt, Germany

Organiser: Eva Thomm, University of Erfurt, Germany

Organiser: Friederike Hendriks, University of Münster, Germany

Discussant: Marc Stadler, University of Bochum, Germany

These days many issues of practical or professional relevance are based on expert knowledge, such as health consequences of cell phone radiation, or benefits of inclusive education. Yet, we may or can often gain only partial understandings of such topics, and rely on the trustworthiness of expert sources. Especially when issues entail different, even conflicting viewpoints and/or scientific uncertainty, individuals need to deliberate which source to believe (if at all). For using expert knowledge, it is therefore important to learn how to identify and evaluate sources providing scientific expertise. Thus, *sourcing* is a critical competence in dealing with expert knowledge, and ought to be acquired during formal education. This symposium aims to clarify understanding of multiple views as prerequisite of sourcing skills, as well as individual factors and topic characteristics that may impact source preferences and evaluation. This is done across different scientific topics (social sciences, history, sciences) and learning contexts (school, everyday life, professional life). The first contribution examines in which way argumentative settings may foster school students' understanding of controversial viewpoints across texts. The second contribution investigates the impact of topic familiarity when laypeople evaluate trustworthiness of competing sources about a history topic. The third contribution shows that information about research methods and cognitive prerequisites affect laypeople's trust in experts regarding climate change information. The fourth contribution examines how capacities and attitudes affect pre-service teachers' preferences of sources to consult educational topics relevant to their future practices.

Supporting Comprehension of Multiple Texts Through Engagement in Dialogic Argumentation

Presenting Author:Kalyps Jordanou, University of Central Lancashire, Cyprus

The ability to judge sources' trustworthiness and to comprehend multiple texts are fundamental for the 21st century citizens. In the present work we examined whether engagement in dialogic argumentation support comprehension of multiple texts. Thirty-eight sixth graders engaged in a dialog-based argument curriculum over 16 80-minute sessions. Students' comprehension of multiple texts was assessed using open-ended questions on controversial topics (Bråten et al., 2013), before and after the intervention. Students showed improvements in their comprehension of multiple texts after their engagement in the intervention, suggesting that promoting students' argumentation skills through a dialog-based argument curriculum is a promising pathway for the development of the comprehension of multiple texts.

The Impact of Topic Familiarity and Disagreement Explanation on Source Evaluation

Presenting Author:Sarit Barzilai, University of Haifa, Israel; **Co-Author:**Talia Shlomi-Elouz, University of Haifa, Israel; **Co-Author:**Eva Thomm, University of Erfurt, Germany

Learners rely on expert knowledge but can face considerable challenges in judging which experts to trust. This study examined the effects of topic familiarity and of reading an explanation about possible causes for disagreement between expert researchers on learners' judgments of the trustworthiness of dissenting expert sources and on their trustworthiness evaluation strategies. Additionally, we examined if epistemic perspectives regarding the nature of knowledge and knowing moderate the effects of topic familiarity and disagreement explanation on source trustworthiness judgments. Participants read conflicting accounts about an unfamiliar or a familiar historical event. Topic familiarity affected trustworthiness judgments in accordance with participants' prior beliefs, suggesting a source evaluation bias. Analysis of trustworthiness evaluation strategies revealed that when the topic was familiar, participants based their trustworthiness judgments increasingly on knowledge-based validation and less on discourse-based evaluation and corroboration. Providing a disagreement explanation did not generally mitigate the effect of topic familiarity on trustworthiness judgments. However, the effect of providing a disagreement explanation was moderated by epistemic perspectives: When absolutism was low or multiplism was high, providing a disagreement explanation decreased the impact of topic familiarity. Yet, when absolutism was high or multiplism was low, the disagreement explanation had the reverse effect. Overall, the results suggest that both learners' topic familiarity and their epistemic understandings of the nature and causes of expert disagreement underlie judgments of expert trustworthiness. Our findings point to the complex challenges involved in promoting learners' abilities to evaluate conflicting expert reports.

Do Insights Into Research Methods Affect Trust in Scientists and Deference to Experts?

Presenting Author:Friederike Hendriks, University of Münster, Germany; **Co-Author:**Regina Jucks, WWU Münster, Germany

Uncertainty is a key element of science. The scientific community aims to reduce uncertainty by committing to and evolving a set of accepted and reliable methods. (Process) Knowledge about such research methods has recently been ascribed a core facet of scientific literacy. Regarding climate change much of public debate has addressed the state of empirical data and subsequent interpretation. In two studies, we ask whether process knowledge would affect the way people make their mind up about uncertain climate change issues, and how they evaluate sources. In study 1, we found that the activation of process

knowledge resulted in more attention to the uncertainty of study results, resulting in lower trust in conclusions drawn from them (but not general trust in climate science). In study 2, we found that the type of process knowledge (doing science vs. expert debate) did not affect participants' trust ratings, or epistemic cognition. The reported certainty that scientific processes would achieve reliable knowledge only affected their perceived efficiency in making source evaluations and relying on their own opinion. Intellectual epistemic style was identified as a predictor of individuals' source evaluations, general trust and epistemic cognition, and decision making. We conclude that the information on process knowledge available to readers does not affect their ratings, but rather the amount of uncertainty salient in the information. Furthermore, intellectual epistemic style as a more general attitude to approach science-based problems has a strong influence not only on specific processes of epistemic cognition, but also on trust judgments.

Examining Predictors of Source Preferences in Empirical Educational Research

Presenting Author:Eva Thomm, University of Erfurt, Germany; **Co-Author:**Andreas Lederer, University of Erfurt, Germany; **Co-Author:**Johannes Bauer, University of Erfurt, Germany

Being able to retrieve and use scientific information is not only relevant to one's everyday life, but may also become crucial in the professional context. Policy calls in teacher education are a current example advocating for professional practice based on scientific knowledge, rather than tradition or intuition. Reception and usage of evidence of educational research requires pre-service teachers to develop not only capacities to retrieve and interpret research, but also conducive attitudes, beliefs, and motivational orientations towards its usefulness and relevance. As sourcing may represent a first step to retrieve evidence from educational research, we examined whether and in which ways (1) individual capacities to retrieve and interpret evidence as well as (2) attitudes and orientations towards evidence may affect pre-service teachers' preferences for scientific and non-scientific sources to consult educational topics. Pre-service teachers assessed their preference for different scientific and non-scientific sources regarding different educational topics. Skills in finding primary scientific literature and self-assessed understanding of research methods, attitudes towards and need for evidence as well as faith in intuitions served as predictors. Regression analyses revealed that positive attitudes towards and appreciation of evidence positively predicted pre-service teachers' endorsement of scientific sources; in contrast, endorsement of non-scientific sources was shaped by lower capacities in finding primary scientific literature and stronger faith in one's intuitions. These findings underline that individual capacities and attitudes shape source preferences and may thus act as a filter that potentially prevent subsequent processes of evidence reception.

Session S 9

16 August 2019 10:15 - 11:45

Seminar Room - S16

Single Paper

Assessment and Evaluation, Learning and Special Education

Language Learning and Teaching in Culturally Diverse Settings

Keywords: At-risk students, Bilingual education, Cultural diversity in school, Early childhood education, Language (Foreign and second), Language (L1/Standard Language), Second language acquisition, Teacher Effectiveness

Interest group: SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Yuri Uesaka, The University of Tokyo, Japan

Student Characteristics of French as a Second Language Programs in Canada

Keywords: At-risk students, Bilingual education, Cultural diversity in school, Language (Foreign and second)

Presenting Author:Diana Burchell, OISE, University of Toronto, Canada; **Co-Author:**Erhan Sinay, Toronto District School Board, Canada; **Co-**

Author:Christopher Barron, OISE/University of Toronto, Canada

Aims: This study aims at providing an empirical overview of student characteristics in French as a Second Language programs in the Toronto District School Board (TDSB). We compare two primary intensive French programs: French Immersion (FI) and Extended French (EF). FI commences in senior kindergarten. Students initially receive 100% of the school instruction in French. English is introduced in Grade Four and gradually increases in instructional time. EF begins in Grade Four, with students receiving about 50% of the instruction each in French and English. Both FI and EF programs include English-speaking and English Language Learners; these children are bilingual in English and French, and trilingual in English, French, and their first language, respectively. It is important to examine the efficacy of different French as a Second Language programs and promote best educational practices. **Methodology:** All data utilized in this study was collected through three comprehensive sources: the TDSB student and parent censuses, which is conducted approximately every five years, and the TDSB's School Information System (SIS). In this study, we use three census years combined with the SIS data in these years. **Theoretical and Educational Significance:** The results reveal strengths and limitations of different dual language programs. Within the past decade, some researchers have investigated the discrepancies between the policy behind dual-language programs and their implementation (De Palma, 2010; Lee, 2007). This study will furthermore contribute to a growing body of research that compares bilingual programs across different linguistic and cultural contexts (Fishman, 1976; Schwartz et al., 2017).

Stakeholder Perception of French Language Programs in the Toronto District School Board

Keywords: Bilingual education, Cultural diversity in school, Language (Foreign and second), Teacher Effectiveness

Presenting Author:Diana Burchell, OISE, University of Toronto, Canada; **Co-Author:**Xi Chen, OISE/University of Toronto, Canada; **Co-Author:**Erhan Sinay, Toronto District School Board, Canada; **Co-Author:**Amie Presley, Toronto District School Board, Canada; **Co-Author:**David Cameron, Toronto District School Board, Canada; **Co-Author:**Thomas Ryan, Nipissing University, Canada

Aims: The Toronto District School Board (TDSB) is one of the largest and most diverse school boards in Canada and in the world. This study examines challenges and successes of all three French programs in the board (French Immersion, Extended French, and Core French) from key stakeholder's perspectives. The provincial government of Ontario has acknowledged a need to increase French as a Second Language (FSL) student enrollment and retention (Ontario Ministry of Education, 2013). At the same time, studies suggest a decrease in enrollment in Core French programs (Boudreaux, 2011). There are concerns about quality of FSL instruction, multiple entry points, inequities of access, staffing, and program viability in most school boards in Ontario (Sinay, 2015; Masson, Arnott, & Lapkin, 2017). Diversity in the board presents opportunities along with challenges to effective educational improvement and planning. **Methodology:** Developmental evaluation is an opportunity to share and generate learning while engaging in a program as part of the team (Glickman, Gordon, & Ross-Gordon, 2010). Adopting a developmental evaluation design, this study was conducted in collaboration with the French Department of the board. **Theoretical and Educational Significance:** This study is the most comprehensive evaluation of the French Programs in Canada's largest and most diverse school board therefore, findings of this study have wide ranging of programming and policy implications on quality of instruction, inclusive practices, equity of access, staffing, program viability, and entry points.

Intervention of pretend play on children's self-regulation and language skills

Keywords: At-risk students, Cultural diversity in school, Early childhood education, Language (L1/Standard Language)

Presenting Author:Tanya Paes, University of Cambridge, United Kingdom; **Co-Author:**Michelle Ellefson, Cambridge University, United Kingdom

There has been increasing interest in the contribution of pretend play towards children's cognitive development. This study examines the efficacy of a pretend play intervention on the self-regulation and language skills of four- to five-year-olds with English as an Additional Language (EAL). Pretend play includes a pretender projecting a mental representation onto reality. The sample consisted of 151 children who were randomized into two groups: (a) Pretend play; and (b) Art activities. A third untreated controlled group was also included in the study which allowed for examination of the results with respect to the type of activity carried out—pretend play and art. The intervention included sixteen 30-minute sessions in groups of six to seven children. Each session included: (1) storybook reading; (2) role-playing; and (3) review. During storybook reading explicit phonological awareness and vocabulary instruction were provided for 18 words in each book. Role-playing involved giving children props to partake in pretend play. Review consisted of revising the PA and vocabulary of the target words. The improvements that occurred in the children's self-regulation and language skills are considered alongside other cognitive and educational factors to better

comprehend the role of pretend play in educational settings.

Language Skills of Bilingual and Trilingual Students in Canadian French Immersion

Keywords: Bilingual education, Language (Foreign and second), Language (L1/Standard Language), Second language acquisition

Presenting Author:Diana Burchell, OISE, University of Toronto, Canada; **Co-Author:**Bonita Squires, Dalhousie University, Canada; **Co-Author:**Patricia Cleave, Dalhousie University, Canada; **Co-Author:**Janani Selvachandran, OISE/University of Toronto, Canada; **Co-Author:**Xi Chen, OISE/University of Toronto, Canada

Aims: This paper examines the language development of two groups of Canadian students: French-English bilinguals and French-English trilinguals (English Language Learners). While extensive research has been conducted on oral language of monolingual children, much less is known about bilingual and, especially, trilingual (multilingual) children (Gagarina, Klop, Tsimpli & Walters, 2016; Hipfner-Boucher, Pasquarella, Chen & Deacon, 2014). **Methodology:** One hundred and seventeen school-aged children (7-10) received a battery of language measures in one or both languages. There were 82 children in grade two (age 7-8) and 34 children in grade 3 (age 9-10). All children received two narrative measures including a story stem measure and a simplified version of the Test of Narrative Language (TNL; Gillam & Pearson, 2004). Receptive vocabulary was assessed with the PPVT (Dunn & Dunn, 2007) in English and a parallel measure, EVIP, in French (Dunn, Dunn, & Theriault-Whalen, 1993). In addition, a non-word repetition measure was administered. Finally, a standardized reading comprehension measure was administered (MacGinitie & MacGinitie, 1992). **Theoretical and Educational Significance:** Preliminary results indicate that trilingual students are not underperforming in their development in English as compared to their bilingual counterparts. Further, these trilingual students are actually outperforming the anglophone students on several French language measures. This needs to be further examined in order to understand the mechanisms through which bilinguals and trilinguals process language to see which processes are bolstering the skills of trilingual students.

Session S 10

16 August 2019 10:15 - 11:45

Seminar Room - S07

Single Paper

Cognitive Science, Lifelong Learning

Metacognition, Self-regulation and Reading Comprehension

Keywords: Cognitive development, Cognitive skills, Informal learning, Language (Foreign and second), Learning Technologies, Metacognition, Neuroscience, Reading comprehension, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Jelena Radisic, University of Oslo, Norway

Screen or paper? The effect of reading medium on children's comprehension and meta-comprehension

Keywords: Cognitive development, Learning Technologies, Metacognition, Reading comprehension

Presenting Author:Vered Halamish, Bar-Ilan University, Israel; **Co-Author:**Elisya Elbaz, Bar-Ilan University, Israel

Recent studies with adults and adolescents suggest that reading on screen impairs reading comprehension and metacomprehension accuracy, compared to reading on paper. However, it is unclear whether the same is true for young, elementary school children, especially given their extensive use of technology nowadays. The goal of the present study was to examine the effect of reading medium, screen versus paper, on elementary-school children's reading comprehension, metacomprehension, and reading time. Second and fifth graders read short texts on paper and on screen, and their self-paced reading time was recorded. For each text, they then judged their comprehension and completed a comprehension test. They also answered questionnaires that assessed their usage of computers and preferences for reading on screen versus on paper. Results revealed better reading comprehension and less overconfidence when reading on paper versus when reading on screen. Reading time was not affected by the medium used for reading. These results were observed both for second graders and fifth graders and were not moderated by the extent of computer usage or by children's medium preferences. Theoretical and practical implications will be discussed.

Everything is Easy with the Internet! Conditions of Metacognitive Overestimation with Internet Use

Keywords: Informal learning, Learning Technologies, Metacognition, Self-regulation

Presenting Author:Stephanie Pieschl, Technical University of Darmstadt, Germany; **Co-Author:**Janene Budd, University of Newcastle, Australia

Previous research indicates that Internet use increases peoples' overestimation of their own ability to answer explanatory knowledge questions. This Overestimation-with-Internet-Bias (OIB) might result in premature termination of tasks, suboptimal performance, and decreased motivation in educational contexts. Thus, it is important to explore the conditions and limits of this phenomenon further. Consequently, this study tested if the OIB could be replicated in a within-subject design (Hypothesis 1), with metacognitive confidence judgments (Hypothesis 2), and with complex socio-scientific issue questions (Hypothesis 3). In a 3x2x2 design, students ($N = 34$) were confronted with six knowledge questions that differed according to question type (factual, explanatory, and socio-scientific) and Internet use (Internet vs. No-Internet). For each question, students metacognitively judged their ability and confidence before and after answering the question (factor: time). Results confirmed the OIB with *predictive* metacognitive *ability and confidence* judgments regarding *complex explanatory and socio-scientific issue* questions in a *within-subject* design. However, we found no OIB with *postdictive* metacognitive judgments or regarding *simple factual* questions. Thus, students might overestimate themselves substantially for any complex academic task involving the Internet, especially before they start the task. Furthermore, students in this study showed mediocre performance at best, which might indicate that they underestimate the demands of complex tasks or are unable to take full advantage of the information on the Internet. Teachers and students should be aware of these subtle but potentially detrimental side effects of using the Internet.

The effect of metacognitive use of learning strategies on student test performance

Keywords: Cognitive skills, Language (Foreign and second), Metacognition, Self-regulation

Presenting Author:Eriko Ota, University of Tokyo, Japan; **Co-Author:**Emmanuel Manalo, Kyoto University, Japan; **Co-Author:**Natalia Suárez Fernández, University of Oviedo, Spain

Promoting effective learning strategy use is an important educational issue. Research studies have shown that deep-processing strategies lead to better academic performance than shallower strategies. However, students in reality encounter various types of tasks, some of which do not necessarily require deep processing. Thus, it is worth examining whether students metacognitively adapt their strategy use to such task demands. Here we show (i) the extent to which students adapt their use of deep/shallow strategies depending on task demands, and (ii) how such adaptation relates to their test performance. 304 8th- and 9th-grade students were asked to learn English vocabulary words and to report what strategies they used for each possible task demand (i.e., learning spelling/pronunciation, definition, and usage). Students then took a vocabulary test. Cluster analysis showed that there were roughly three types of learning styles: learners who adapted their use of deep/shallow learning strategies to the task demands, ones who held fast to using deep or shallow strategies, and ones who did not metacognitively use strategies. ANOVA showed that the ones who used various strategies in an adaptive way got higher scores than the others, in this case because the test itself was comprised of tasks requiring both deep and shallow processing. These suggest that in advising students about strategy use, it is important to consider what types of tasks we assign, rather than just emphasizing the importance of deep-processing strategy use. The findings indicate the importance of metacognition in strategy use for effective learning performance.

Using fNIRS in a Multitrait-multimethod Investigation of Strategic Processing during Reading

Keywords: Metacognition, Neuroscience, Reading comprehension, Self-regulation

Presenting Author:Daniel Dinsmore, University of North Florida, United States; **Co-Author:**Jesse Macyczko, University of North Florida, United States; **Co-Author:**Sabrina Greene, University of North Florida, United States; **Co-Author:**Katherine Hooper, University of North Florida, United States

There has been a debate in the literature on the effects of think-aloud protocols on cognitive and metacognitive processing for some time. This study is designed to use behavioural data (i.e., functional near-infrared spectroscopy; fNIRS) in addition to retrospective self-report data to test whether and how think-aloud protocols may influence cognitive and metacognitive processing. With data collection ongoing, 37 participants from a large urban public university answered prior knowledge questions about a topic for which they were reading, read the passage, responded to a retrospective survey about their strategy use, and answered some questions about that passage. Participants were randomized into three groups during reading – a silent-reading group, reading-aloud group, and a think-aloud group. While analyses are ongoing to increase power as additional data are collected, these analyses revealed that both mean brain activation and retrospective self-report of processing was equivalent among the three groups. However, there were some small, but important, differences with regard to brain activation in five areas measured in the prefrontal cortex among those three conditions. Implications for what think-aloud protocols measure and how they might influence cognitive and metacognitive processing are discussed.

Session S 11

16 August 2019 10:15 - 11:45

Seminar Room - S05

Single Paper

Cognitive Science, Learning and Instructional Technology

Online Measures of Learning Processes

Keywords: Arts, Cognitive skills, Comprehension of text and graphics, Computer-assisted learning, Developmental processes, Educational Psychology, Emotion and affect, Learning and developmental difficulties, Literacy, Multimedia learning, Neuroscience, Quantitative methods, Reading comprehension, Self-regulation

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Michael Sailer, Ludwig-Maximilians-Universität, Germany

Integration Specificity: An Investigation of Objective and Open-Ended Assessments

Keywords: Comprehension of text and graphics, Literacy, Quantitative methods, Reading comprehension

Presenting Author: Alexandra List, The Pennsylvania State University, United States

We examine how U.S. adults integrate, or form connections across, multiple texts addressing a complex and controversial topic (i.e., trophy hunting). Via both objective and open-ended measures of integration assessment we further consider how adults form connections between evidence presented in texts, central claims across texts, and meta-textual features. We find thematic connections to be most commonly formed, with meta-textual integration evidenced to the most limited extent. We corroborate these findings across both objective and open-ended measures of integration and discuss directions for future research. We provide evidence both for the importance of considering the specificity at which individuals may integrate texts and the need to consider a variety of methods when assessing integration.

Navigation strategies in multimedia environments in dyslexia: a developmental perspective

Keywords: Developmental processes, Learning and developmental difficulties, Multimedia learning, Self-regulation

Presenting Author: Carolien A. N. Knoop-van Campen, Radboud University Nijmegen, Netherlands; **Co-Author:** Eliane Segers, Radboud University Nijmegen / University of Twente, Netherlands; **Co-Author:** Ludo Verhoeven, Radboud University Nijmegen, Netherlands

Students with dyslexia are often provided with extra audio to support their reading, creating a multimedia environment, even though this may hamper learning and changes learning processes. To be able to optimally learn in these environments, it is important to use efficient navigation strategies, which have to be developed over time. We compared the navigation strategies of 47 primary school children and 42 university students with dyslexia with those of their typically developing peers ($N = 59 / N = 44$), and examined how adding audio changed their strategies. Log files were recorded to identify the navigation strategies, which were plotted and coded into four categories: linear, big peaks, small peaks, and combined peaks. Results on primary school children show mostly linear navigation strategies in both conditions and groups. Regarding university students, more linear and less combined strategies were used when audio was added. When audio was included, students with linear strategies remembered less knowledge than students using combined strategies. To conclude, this study showed that adding audio changes navigation strategies but only for adults, and that it does so similar for people with and without dyslexia. Whereas primary school children mostly navigate in a linear way through multimedia environments, university students use different strategies. In these students, adding audio leads to less self-regulation and less knowledge gains. Not the type of navigation strategy seems to define learning, but learning is affected when students are forced by audio to use a different strategy than they would use naturally.

Eye Movements Reflect Musicians' Planning for Local Embellishments during Music Reading

Keywords: Arts, Cognitive skills, Comprehension of text and graphics, Educational Psychology

Presenting Author: Marjaana Puurtinen, University of Turku, Finland; **Co-Author:** Erkki Anto, University of Turku, Finland; **Co-Author:** Anna-Kaisa Ylitalo, Natural Resources Institute Finland, Finland; **Co-Author:** Erkki Huovinen, Royal College of Music in Stockholm, Sweden; **Co-Author:** Hans Gruber, University of Regensburg, Germany; **Co-Author:** Suvii Heinonen, University of Jyväskylä, Finland; **Co-Author:** Hanna Turta, University of Turku, Finland

In folk music, one mark of expertise is the ability to add various types of embellishments, such as ornamentation or rhythmic, melodic or harmonic variations, into the performed music. This study explores folk musicians' cognitive chunking strategies, when musicians add such elements into their performances during a temporally controlled music-reading task. Twenty-six folk violinists performed a melody while their eye movements were recorded. The two last beats of one musical bar was selected as the target area. It was hypothesized that the adding of embellishments would be predicted by an increase in fixation time for the modified note symbols. The "extra" time would be needed for selecting an appropriate embellishment and retrieving a suitable motor response from long-term memory. A generalized linear mixed effects model analysis with selected predictors supported the hypothesis; however, the adding of embellishments was predicted by the time spent on notes preceding the target area, i.e., the beginning of the same musical bar. This suggests that the target area was at least partly processed within the area of accurate vision while the gaze still targeted the preceding notes. This, in turn, supports the assumption that musical bars are treated as meaningful visual units during music reading, and that this unit is applied in the planning for suitable motor responses. The observation is an important step for studies searching eye-movement indicators for those cognitive mechanisms that underlie successful music reading and performance. More analyses, and with a double-size data set, will be reported at the conference.

Predicting tutorial viewing time from online cognitive states in learning to play a new video game

Keywords: Cognitive skills, Computer-assisted learning, Emotion and affect, Neuroscience

Presenting Author: Julien Mercier, University of Quebec in Montreal, Canada; **Co-Author:** Ange-Adrienne Nyamen-Tato, Université du Québec à Montréal (UQAM), Canada; **Co-Author:** Matthew Martin, Université du Québec à Montréal (UQAM), Canada; **Co-Author:** Daniel Rivas, Université du Québec à Montréal (UQAM), Canada

Videogames usually involve complex mechanics that must be learned to play competently. In-game tutorials is a common device to help players learn, but their use is reputedly suboptimal. A first step in explaining this situation and eventually improve in-game tutoring is to investigate cognitive preconditions to reading in-game tutorials, which is the goal of this presentation. Since a videogame is mainly a visual experience involving noticing pertinent features and comprehending relevant information, we focused on gaze behavior (Shifferaw et al, 2018) and two pertinent aspects of cognitive functioning: cognitive engagement (Pope, Bogart, & Bartolome, 1995) and cognitive load (Holm, 2009). 35 participants played FarCry Primal™ for 90 minutes. Gaze behavior and electroencephalography were recorded concurrently with the performance in the game. The data stream was indexed with tutorial episodes. The exploratory analyses involved multimodal LSTM (long short-term memory), a form of machine learning based on neural networks. The most powerful model can predict long versus short viewing times (over or below the sample's median viewing time for a given tutorial, while minimizing contextual (inter-tutorial) variations) with 72%

accuracy, considering the data of the 10 seconds preceding a tutorial appearance. The main implication is that there is no predictive value in going back more than 10 seconds prior to the tutorial. However, the variability in the results suggests that, in order to benefit from the potential richness of the current analytical approach, that instances to be predicted require a more elaborate or adequate classification, either on conceptual or empirical grounds.

Session S 12

16 August 2019 10:15 - 11:45
Seminar Room - S02
Single Paper
Teaching and Teacher Education

Teacher Effectiveness

Keywords: Attitudes and beliefs, Competencies, Educational technology, Emotion and affect, Intelligence, School effectiveness, Secondary data analysis, Social aspects of learning and teaching, Survey Research, Teacher Effectiveness, Teaching/instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 11 - Teaching and Teacher Education, SIG 18 - Educational Effectiveness

Chairperson: Claudia Krille, Goethe University Frankfurt, Germany

Teachers' Theories of Intelligence and Pedagogical Practice in English Secondary Education

Keywords: Attitudes and beliefs, Intelligence, Teacher Effectiveness, Teaching/instruction

Presenting Author:Chloe Cutler, Liverpool John Moores University, United Kingdom; **Co-Author:**Dave Putwain, Liverpool John Moores University, United Kingdom; **Co-Author:**Andrea Mallaburn, Liverpool John Moores University, United Kingdom; **Co-Author:**Angela Daly, Liverpool John Moores University, United Kingdom

Individuals are said to hold implicit intelligence beliefs on a continuum from an entity theory, where intelligence is fixed, through to an incremental theory, with intelligence recognised as malleable. Previous research has documented the key role of Dweck's theory of implicit beliefs in shaping individuals' behaviours and larger meaning systems, including goal selection, response to failure and academic outcomes. At present, limited research explores this in relation to teacher instructional practice. Broader evidence, however, has suggested that some teacher practices are enacted in accordance with belief, for example goal structures and teacher practice; while other research reports incongruence between teacher belief and practice, such as group work beliefs and practice. The aim of this study was to explore English secondary school teachers' implicit beliefs of intelligence in relation to their classroom instructional practices; data were collected through a mixed-methods design. Teachers completed Dweck's pre-existing implicit theory of intelligence questionnaire, followed by 1 lesson per teacher video recorded (teacher-student interactions were coded) and a semi-structured interview about the interactions in the lesson. Findings from the study suggest reported implicit intelligence beliefs of teachers operate dynamically, with fluctuation between the belief-practice alignments, as mediated by context.

School resources for teaching: How between-school variance in instructional quality can be explained

Keywords: School effectiveness, Secondary data analysis, Teacher Effectiveness, Teaching/instruction

Presenting Author:Doris Holzberger, Technical University of Munich (TUM), Germany

While teachers (and their students) are the main protagonists for instructional quality, differences in instructional quality across schools have also been revealed. So far, this between-school variance has not yet been explained. Therefore, the present study examines differences in instructional quality across schools and how they can be explained by schools' contextual as well as process variables. PISA 2003 data were re-analyzed, where 1,939 mathematics and science teachers from 198 schools rated their instructional quality (disciplinary demand, maximized time use, and quality of feedback). Teachers as well as principals rated school process variables such as leadership behavior, collaboration among colleagues, and learning climate. School's academic track was used as contextual indicator for students' (achievement) composition. Multi-level analyses revealed medium to high agreement among teachers with regard to school characteristics (AD_M), and low to medium intra-class correlations for instructional quality. The random-intercept models showed significant differences for schools' academic track, leadership, collaboration, and learning climate. Before we were unable to model the multi-level structure of instructional quality and didn't know the reasons why schools differ in instructional quality, now we identified contextual as well as process variables as predictors. Therewith, schools do indeed provide relevant resources for teaching.

The Predictive Role of Teacher Emotions in Learner Autonomy Support

Keywords: Emotion and affect, Social aspects of learning and teaching, Teacher Effectiveness, Teaching/instruction

Presenting Author:Canan Koç, Cumhuriyet University, Turkey

This study aims at determining the predictive level of teacher emotions in supporting learner autonomy. 192 teachers (138 female and 54 male) working in the primary, secondary and high schools in Kars province (Turkey) incorporated in the study. According to the results of the multiple regression analysis, which was used to analyse the research data, it is found that enjoyment, among teacher emotions, is a statistically significant predictor of the feeling and thinking support, learning process support and evaluation support sub-dimensions of learner autonomy support. It is found that anger and anxiety do not significantly predict learner autonomy support. The findings were discussed with regard to the related literature.

The Role of Self-Regulatory Preferences in Teachers' Willingness to Innovate

Keywords: Competencies, Educational technology, Survey Research, Teacher Effectiveness

Presenting Author:Emely Hoch, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Steffen Schmidgall, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Kai Sassenberg, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

The advent of digital media into the classroom poses teachers with the challenge of significantly changing the way they teach. Teachers' self-regulation preferences might influence how they perceive these changes and whether they are willing to take up innovations. According to regulatory focus theory (Higgins, 1997), it can be distinguished between promotion focus and prevention focus to describe self-regulation preferences. Individuals with a stronger promotion focus strive for success and are more sensitive to positive events, whereas individuals with a stronger prevention focus strive for security and are more sensitive to negative events. It was expected that the stronger the promotion focus of teachers, the stronger their willingness to innovate should be. As part of a bigger project that investigates the use of tablet computers in classrooms, teachers filled in an online survey before tablet computers were given to their students. This survey consisted of a self-report questionnaire to assess teachers' promotion and prevention focus, as well as their willingness to innovate. In total, data from 140 teachers were analyzed. It was found that promotion focus is a powerful predictor in change contexts, whereas prevention focus does not relate to such variables. Regulatory focus theory, thus, seems well able to explain innovativeness in the school context. However, more research is needed on how teacher support can be best tailored to fit their self-regulatory preferences.

Session S 13

16 August 2019 10:15 - 11:45
Seminar Room - S13
Single Paper
Teaching and Teacher Education

Pre-Service Teacher and Science Education

Keywords: Communities of practice, Design based research, Higher education, Mixed-method research, Pre-service teacher education, Problem-based learning, Reflection, Science education, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Rui He, University of Glasgow, United Kingdom

Novice Teachers' Appropriation of Ambitious Teaching Practices for High-Level Student Thinking

Keywords: Design based research, Pre-service teacher education, Science education, Teaching/instruction

Presenting Author: Miray Tekkumru-Kisa, Florida State University, United States; **Co-Author:** Sebnem Atabas, Florida State University, United States; **Co-Author:** Ryan Coker, Florida State University, United States

There has been an increasing demand on teacher educators to empower pre-service teachers' capacity in enacting ambitious teaching practices that entail uncovering students' emerging and changing ideas, and advancing their high-level thinking and sensemaking. This study aims to investigate pre-service teachers' learning within the context of a video-based methods course that focuses on ambitious teaching practices for promoting cognitive demand on students' thinking. We also investigated how pre-service teachers appropriated conceptual and practical tools that aimed to facilitate high-level student thinking during their first full-time teaching. Our preliminary analysis of pre-service teachers' planning and reflection artifacts from this methods course and the interviews with them during their first full time teaching have provided insights into pre-service teachers' interpretations of the focal ambitious teaching practices and revealed variation in their appropriation of the conceptual and practical tools for promoting cognitive demand on student thinking. The study findings provide implications for design of methods courses that aim to facilitate pre-service teachers' capacity in enacting ambitious teaching practices that entail responsiveness to students' ideas and facilitation of their sensemaking.

Boundary Crossing: Impact of a University-STEM Industry Engagement on Secondary Students in Science

Keywords: Communities of practice, Pre-service teacher education, Problem-based learning, Science education

Presenting Author: Carol Aldous, Flinders University, Australia

This paper discusses the impact of a university-industry engagement activity undertaken by student teachers of secondary science and its flow on effect to students in schools. The purpose of the activity was to assist student teachers make meaningful connections between theoretical science knowledge and its application in society. The project titled *Bridging the Gap: Connecting science education with the real world* enabled 36 pre-service teachers to cross the boundary of teacher education into the world of industry and back through three short industry placements. During the border crossing activity student teachers identified, translated and communicated a STEM industry problem to an authentic audience. Subsequently student teachers undertook their final teaching practicum for 8 to 10 weeks. Measures of the project's impact were ascertained by focus group interview and questionnaire pre and post the industry visit as well as with secondary students' pre and post the teaching practicum. The student teacher questionnaire was purpose designed. The questionnaire for secondary students comprised the PISA 2006/2015 science attitudes, engagement and motivation inventory. The percent agreement pre (n= 213) and post (n=305) the teaching practicum were compared alongside state (South Australian) and national (Australian) figures. In a matched sample (n= 108) five dimensions, *science self-efficacy*, *science related activities*, *future-oriented science motivation*, *science teaching uses investigations* and *science self-concept* were found to be significantly different pre to post. In the unmatched sample the mean percent agreement increased pre to post for all dimensions except science teaching uses hands on activities where it remained the same.

Making theory-practice-connection more visible by using videotaped role-playing in academic settings

Keywords: Higher education, Pre-service teacher education, Reflection, Science education

Presenting Author: Dagmar Festner, University of Paderborn, Germany; **Co-Author:** Bianca Steffen, University of Paderborn, Germany

The ability to make connections between theories learnt at university and future teaching practice is a challenging task for many pre-service teachers. Therefore, researchers suggest to strengthen the theory-practice connection in pre-service teacher education (Feiman-Nemser, 2001; Blomberg et al., 2013). Video-based feedback is a powerful tool to enhance perception of theory-practice-connections and induce reflective thinking processes (Kleinknecht & Gröschner, 2016). The aims of the study were (1) to design an authentic learning environment in which pre-service teachers can learn to cope with classroom disturbances in combination with theory-based reflection, and (2) to evaluate possible effects of the intervention on *readiness for reflection*. The workshop *classroom disturbances* consists of short theoretical inputs and four scenarios, in which one student slips into the role of the teacher and the others take over the role of pupils. In three workshops N=36 pre-service teachers filled in a questionnaire at the start and end of the workshops and provided qualitative feedback. As pre-service teachers estimated their *readiness for reflection* (11 items, $\alpha=.84$) at the beginning on a 5-point Likert-scale quite high ($M=4.09$, $SD=.50$) the fractional increase to $M=4.15$ ($SD=.56$) is not significant ($t(29)=-1.30$, $p=n.s.$). However, the evaluation did show that the workshop was received very positively: The pre-service teachers learned to consider multiple perspectives ($M=4.18$, $SD=.95$), Became more aware of theory-practice-connections ($M=4.48$, $SD=.80$) and recognized the relevance of reflective thinking for their future professional life ($M=4.27$, $SD=.84$). Qualitative feedback showed that participants attach great importance to reflection on the specific action during role-playing.

Learning to evaluate instructional materials for inquiry-based education by comparing examples

Keywords: Higher education, Mixed-method research, Pre-service teacher education, Science education

Presenting Author: Marco Longhitano, PH Schwyz, Switzerland; **Co-Author:** Judith Arnold, Schwyz University of Teacher Education, Switzerland; **Co-Author:** Rachel Schwager, Pädagogische Hochschule Schwyz, Switzerland; **Co-Author:** Lennart Schalk, PH Schwyz, Switzerland

Evaluating the quality of teaching materials is a key skill of teachers. We investigated whether this skill benefits from the comparison of teaching materials. Typically, direct comparison of two entities (in contrast to sequential processing) helps to encode structural similarities which in turn improves transfer. This learning process has not yet been investigated with complex entities such as teaching materials (comprising hands-on materials, work sheets, instructions for teachers etc.). We randomly assigned 91 first-year pre-service elementary school teachers to two conditions. In both conditions, we presented the same two teaching materials. Both materials are well-designed because they implement several forms of guidance which are necessary to make inquiry-based learning effective. In the experimental condition, both materials were presented simultaneously and their comparison was prompted with targeted questions. In the control condition, the two materials were shown one after the other, with prompt to describe the single materials, but without prompts to compare them. After this learning phase, we presented a third teaching material which lacks specific forms of guidance. The teachers had to write a critique of this third material (i.e. to describe the quality). We expected that teacher in the experimental condition would make more references to guidance (and forms thereof) in their critiques. However, we found no significant differences between conditions. We briefly discuss possible reasons.

Session S 14

16 August 2019 10:15 - 11:45

Seminar Room - S09

Single Paper

Culture, Morality, Religion and Education, Educational Policy and Systems, Motivational, Social and Affective Processes, Teaching and Teacher Education

Cultural Diversity in Schools

Keywords: At-risk students, Attitudes and beliefs, Cultural diversity in school, Educational policy, Emotion and affect, Interdisciplinary, Language (Foreign and second), Multicultural education, Quantitative methods, Self-efficacy, Social aspects of learning and teaching, Teacher professional development, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Anna-Lena Rottweiler, Augsburg University, Germany

Teacher's perceptions about multilingualism and spontaneous translanguaging during a lesson

Keywords: Cultural diversity in school, Language (Foreign and second), Multicultural education, Teaching/instruction

Presenting Author: Tarja-Riitta Hurme, University of Turku, Finland; **Co-Author:** Jenni Alisaari, University of Turku, Department of Teacher Education, Finland; **Co-Author:** Sara Routarinne, University of Turku, Department of Teacher Education, Finland

Increasing migration brings multilingual students in classrooms challenging the teachers to apply translanguaging-based pedagogy and to see students' home languages as a resource for learning and instruction. To examine Finnish secondary and elementary school teachers' (N=820) perceptions about the importance of students' linguistic repertoire for the purpose of learning, we analyzed teachers' responses to an open-ended question on how they would react in an imaginary learning situation where multilingual students use their home languages during a collaborative task. The qualitative content analysis of teachers' responses consisted of the following three steps: teachers' (1) attitudes towards using home languages, (2) pedagogical rationale for spontaneous translanguaging, and (3) views on spontaneous translanguaging as a classroom management issue. The results of 237 responses analysed this far show that the majority of Finnish teachers have positive attitudes towards using home languages during a collaborative task, although every fifth teacher reports denial attitude. The pedagogical rationales for allowing their students to use their home language was that the students would work in a task-oriented manner but also language orientation was present in teachers' pedagogical rationalizing. In the presentation, the results of the whole data and practical implications will be discussed.

Teaching in Multicultural Classes: (Prospective) Teachers' Attitudes and Self-Efficacy Beliefs

Keywords: Attitudes and beliefs, Cultural diversity in school, Self-efficacy, Teacher professional development

Presenting Author:Andreas Ortenburger, DZHW - German Centre for Research on Higher Education and Science Studies, Germany; **Co-Author:**Claudia Menge, German Centre for Higher Education Research and Science Studies (DZHW), Germany; **Co-Author:**Hildegard Schaeper, DZHW - German Centre for Higher Education Research and Science Studies, Germany; **Co-Author:**Thorsten Euler, German Centre for Higher Education Research and Science Studies (DZHW), Germany

One goal of teacher education is to prepare prospective teachers to deal professionally with the challenges of diversity in schools. This study examines how individual attributes (e. g. migration background or political attitudes) and contextual characteristics (e. g. aspects of the learning environment) influence the use of learning opportunities offered in higher education, preparatory service (in-service training) and professional life. Furthermore, it explores how the use of learning opportunities affects (prospective) teachers' multicultural beliefs and self-efficacy expectations. Both are considered to be important professional competencies that are significant for dealing with a culturally heterogeneous student body. The analyses are based on data from the Starting Cohort "First-year Students" of the German National Educational Panel Study (NEPS) as well as the "Teacher Education Panel Study" (LAP), which is closely linked to the aforementioned study. Data on multicultural beliefs and self-efficacy expectation were collected in a web-based survey in 2016. The analysed subsample comprises 1,972 participants from different teaching tracks and subjects in different stages of teacher education and teaching career. Preliminary structural equation analysis shows that learning opportunities for teaching in culturally diverse classes indirectly influence teachers' multicultural beliefs by having a positive effect on the self-efficacy expectation, which in turn positively affects the beliefs. The model provides a satisfactory model fit: RMSEA = 0.051; CFI = 0.982; TLI = 0.972. In further analyses we seek to explain the use of learning opportunities by including selected individual and contextual characteristics.

The Relevance of Parental, Peer, and Teacher Support for at-risk Students' School Engagement

Keywords: At-risk students, Cultural diversity in school, Emotion and affect, Quantitative methods

Presenting Author:Zuzanna M. Preusche, University of Duisburg-Essen, Germany; **Presenting Author:**Kerstin Göbel, University of Duisburg-Essen, Germany

Students' school engagement, and especially their emotional school engagement, serves as a predictor for their academic achievement and, hence, their academic success. The concept of school engagement has become a popular topic in educational research within the last decades. Having risen from school dropout related research, school engagement plays a major role for the pedagogical work with at-risk children and youth. One of the major influences on students' well-being and engagement at school is their perceived social support. The present study investigates three different sources of social support: parental, peer, and teacher support, and its influence on emotional school engagement. Results indicate that especially teachers embody a significant role for economically disadvantaged and low performing minority students regarding their emotional school engagement. For other students parents seem to play a major role in terms of their emotional school engagement. The findings underline the importance of teachers' abilities to encourage and support at-risk students, considering their strong influence on the academic development of this group.

Inter-agency working for inclusive education: Facilitating factors, challenges and impacts

Keywords: Educational policy, Interdisciplinary, Multicultural education, Social aspects of learning and teaching

Presenting Author:Catarina Leitão, University of Coimbra, Portugal; **Co-Author:**Joana Guerra, University of Coimbra, Portugal; **Co-Author:**Clara Barata, University of Coimbra, Portugal

Inclusive education can be promoted through partnerships between agencies supporting children and families, such as those in the scope of education, healthcare, social work, and welfare. Partnerships with joint planning and delivery - often referred to as inter-agency working (Milbourne, 2005; Statham, 2011) - determine positive outcomes for children's educational attainment and attendance (Oliver, Mooney, & Statham, 2010; Statham, 2011), and home-learning environment (Melhuish, Belsky, Leyland, Barnes, & NESS Research Team, 2008). However, rigorous evidence on impact and best practices is still limited (Barnes et al., 2017). The aim of this paper was to study facilitating factors, challenges and impacts of inter-agency working for inclusive education. Perspectives of service providers and experiences of service users were analysed in regard to a project aiming to promote inclusive education and academic progress of children in primary school from a Roma community living in a low-income neighbourhood. This project was identified as an example of successful inter-agency working in Portugal (Barnes et al., 2018). Findings indicated that facilitating factors of inter-agency working for promoting inclusive education included taking into account service users' and community' input to ensure that local needs are best served; and establishing informal and collaborative working relationships. The challenges found highlighted the critical role of political support in the development of effective inter-agency working. Positive outcomes were found regarding improved children's school attendance and academic progress, and increased involvement of parents in children's education.

Session S 15

16 August 2019 10:15 - 11:45

Seminar Room - S06

Single Paper

Learning and Social Interaction, Learning and Special Education, Motivational, Social and Affective Processes

Primary Education

Keywords: Attitudes and beliefs, Cooperative/collaborative learning, Cultural diversity in school, Emotion and affect, Mixed-method research, Motivation, Parental involvement in learning, Peer interaction, Primary education, Reading comprehension, Special education

Interest group: SIG 10 - Social Interaction in Learning and Instruction, SIG 15 - Special Educational Needs, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Marwin Felix Löper, Paderborn University, Germany

The Role of Pronounced and Perceived Parental Feedback on Children's Reading Comprehension

Keywords: Motivation, Parental involvement in learning, Primary education, Reading comprehension

Presenting Author:Fabian Hoya, Paderborn University, Germany; **Co-Author:**Frank Hellmich, Paderborn University, Germany

Feedback on learning outcomes is regarded as an important prerequisite for children's learning processes. Feedback is understood as information by significant others (e.g., parents, teachers, peers) with the intention to support students' learning processes and to clarify discrepancies between actual performances and desired learning goals (Hattie & Timperley, 2007). Currently, the question whether and to what degree parents' pronounced feedback and children's perceived feedback on learning outcomes are compatible is not fully answered yet. In addition, the role of parental feedback on children's motivation and their learning outcomes is only little investigated so far. Thus, we examined N=407 primary school students' reading comprehension depending on their pronounced and their perceived parental feedback as well as their intrinsic and extrinsic reading motivation. The results of our study indicate that students' reading comprehension is predicted by their intrinsic and extrinsic motivation. However, students' reading comprehension cannot be explained by their parents' pronounced feedback or

their perceived feedback on their reading outcomes. Whereas parents' pronounced negative feedback predicts students' perceived negative feedback, students' perceived positive feedback cannot be explained by their parents' pronounced positive feedback.

Self-Perceptions and Engagement in Low Socioeconomic Status, Immigrant, and Anxious Students

Keywords: Cultural diversity in school, Emotion and affect, Motivation, Primary education

Presenting Author:Vanessa Kurdi, University of Reading, United Kingdom; **Co-Author:**Isabelle Archambault, Université de Montreal, Canada

According to Connell and Wellborn's Self-System Model of Motivational Development (SSMMD; 1991), school engagement is fostered by students' perception of the fulfillment of their needs for competence, autonomy, and relatedness. The universal claim of this model has rarely been tested across groups with diverse immigration status, socioeconomic status, or emotional problems such as anxiety. To address this issue, this two-year longitudinal study examined the associations between perceptions of competence, autonomy, and relatedness and the three dimensions of school engagement in 256 elementary school students from disadvantaged multiethnic schools, and tested whether immigration status and anxiety further moderated these associations. Results demonstrated that high relatedness was associated with affective engagement in all students. The links between perceptions of autonomy and competence and the engagement outcomes, however, varied as a function of students' immigration status and anxiety levels. Most results showed that anxious immigrant students benefitted even more than other students from perceiving themselves as competent, autonomous, and related to their teacher, favoring a differential susceptibility hypothesis (Belsky, 1997). Finally, results showed that not all students' self-perceptions were positively associated with their school engagement. Findings nuance the universality of the SSMMD and provide new evidence supporting interventions aiming to fulfill psychological needs to promote engagement among vulnerable students.

Student- and Task-Related Predictors of Students' Perceptions of Cooperative Learning Activities

Keywords: Attitudes and beliefs, Cooperative/collaborative learning, Peer interaction, Primary education

Presenting Author:Jolien Mouw, Rijksuniversiteit Groningen, Netherlands; **Co-Author:**Nadira Saab, Leiden University, Netherlands; **Co-Author:**Ron Pat-El, Open University, Netherlands; **Co-Author:**Paul Van den Broek, Leiden University FSW, Netherlands

To be able to effectuate the success of cooperative learning, it is important to understand students' perceptions of specific cooperative learning activities. However, students' perceptions of one and the same cooperative learning activity can vary to a large extent. To gain insight into student- and task-related sources of variability in students' perceptions of a cooperative learning activity we examined if cognitive and social perspective-taking ability, instructional mode, and individual and group level-learning outcomes can predict primary-school students' perceptions of relatively easy and more difficult cooperative learning activities. The PCLA-Q was used to measure students' perceptions of cooperative learning, and subsequent multilevel analyses revealed that social perspective-taking ability explains students' perceptions of their engagement in cooperative behaviors, but only when working on an easy task. Cognitive perspective-taking ability accounts for variability in students' attitudes towards and perceived utility value of a difficult task. The group grade, but not individual learning outcomes, positively predicts students' attitudes and perceived utility value as well as perceptions of engagement in cooperative behaviors both for easy and difficult tasks. We found no evidence that differences in the instructional mode affect students' perceptions of a cooperative activity. Our findings show that students' perceptions of a cooperative learning activity can vary between students and as a function of task-related factors, depending on students' perspective-taking abilities, group learning outcomes, and the difficulty of the task.

Inclusion: The Parent's view on special educational support in inclusive classrooms

Keywords: Mixed-method research, Parental involvement in learning, Primary education, Special education

Presenting Author:Reto Luder, Zurich University of Teacher Education, Switzerland; **Presenting Author:**Andre Kunz, Zurich University of Teacher Education, Switzerland; **Co-Author:**Ariane Paccaud, PH Zürich, Switzerland

Cooperation with parents and their participation in inclusive educational planning is considered as an important element of successful inclusive education. Nevertheless, the parent's view of the implementation of this cooperation as well as the impacts on the parents has not yet been thoroughly examined. Following the SAR-Model (Becker, 2006) satisfaction of parents with the school situation of their children depends at the same time on internal and external resources and stress factors. In this theoretical framework, the following research questions are addressed in the present study: What factors are influencing school satisfaction of parents of children with SEN? How do parents of children with SEN experience their role and their participation in individual educational planning? The sample of this study consists of parents of children with SEN (N=88), now in 6th grade, out of a longitudinal follow-up from a survey starting in grade 3 (Inclusive Education in Switzerland, 2014-2017, with 460 pupils with SEN out of 208 schools). In a mixed-methods-design quantitative and qualitative data were collected. The school satisfaction of parents of children with SEN can be considered in general as high. Regression models show that school satisfaction depends strongly on the perceived information, current confidence, trust towards teachers and specialists and emotional inclusion. Qualitative data provides deeper insights to the findings: For the parents, being informed and involved is very important. Nevertheless, a lot of parents are not experiencing participation but feel rather excluded. The findings are indicating important factors for school satisfaction of parents for further research.

Session S 16

16 August 2019 10:15 - 11:45

Seminar Room - S03

Single Paper

Instructional Design, Learning and Instructional Technology

Instructional Design in Multimedia Learning

Keywords: Comprehension of text and graphics, Educational Psychology, Emotion and affect, Experimental studies, Instructional design, Learning Technologies, Multimedia learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 06 - Instructional Design, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Rosa Hettmannsperger, Goethe-University Frankfurt, Germany

Perceptual influences in graphics processing

Keywords: Comprehension of text and graphics, Educational Psychology, Instructional design, Multimedia learning

Presenting Author:Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France; **Co-Author:**Richard Lowe, Curtin University, Australia

This theoretical paper introduces key ideas about perception to be taken up by following contributions to the symposium. It uses example graphics from the authors' research to argue that perceptual influences on processing can be more important in determining the educational effectiveness of multimedia learning resources than is generally acknowledged within the multimedia research community. Notions from fundamental research on perception are applied to these examples and examined in terms of their likely consequences for subsequent cognitive processing. Particular attention is paid to the consequences for perceptual processing of time-limited display regimes, as occur within system-paced multimedia presentations and animated graphics. Consideration is also given to ways in which the visuospatial and spatiotemporal characteristics of the various components comprising a complex graphic display may influence their perceptual processing, both as individual entities and in combination. Differences in the perceptual attributes of a display's constituent entities in a temporally constrained presentation context can result in competition for a viewer's visual attention that may have undesirable processing consequences. This suggests that systematic analysis of graphic materials destined for use in multimedia learning resources should be undertaken in order to identify then ameliorate potential negative effects. Further, the capacity of individual learners to deal with the demands of processing graphics that provide an explicit and faithful representation of the depicted contents dynamics is likely to vary considerably. Such variation should be addressed when designing multimedia learning experiences. We conclude that graphics-rich multimedia warrant more consideration regarding the influence of visual perception.

Semantically congruent vision and audition: Impact on perception, long-term memory, and learning

Keywords: Educational Psychology, Instructional design, Learning Technologies, Multimedia learning

Presenting Author:Hauke S. Meyerhoff, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Stephan Schwan, Leibniz-Institut für Wissensmedien, Germany

The multimodal nature of human information processing is understudied with regard to human perception, memory, and learning. Addressing this research gap, we present three sets of experiments that addressed the impact of semantic congruency between vision and audition. First, we provide evidence that coinciding semantically matching sounds indeed alters the visual impressions in dynamic displays. Second, we show that semantically congruent auditory and visual information elicits more accurate long-term memory performance than one would expect based on independent retrieval cues. Finally, we present an attempt to transfer these findings to learning processes from instructional videos (without verbal information). For measures of learning, we did not observe a benefit of semantically matching information relative to a purely visual baseline. We discuss the absence of this transfer in terms of attentional guidance as well as task structure. Taken together, the reported experiments provide insights into the benefits of audio-visual information processing as well as current limits of understanding its contribution to learning processes.

Empowering Learners: Teaching a Mental Integration Strategy Supports Learning From Text and Pictures

Keywords: Comprehension of text and graphics, Experimental studies, Instructional design, Multimedia learning

Presenting Author:Björn de Koning, Erasmus University Rotterdam, Netherlands; **Co-Author:**Gertjan Rop, Erasmus University Rotterdam, Netherlands; **Co-Author:**Fred Paas, Erasmus University Rotterdam/University of Wollongong, Netherlands

Research indicates that learning from text and picture is more effective when the two information sources are presented in a spatially integrated format than in a spatially separated format (i.e., split-attention effect). Yet, in educational practice and beyond learners frequently encounter spatially separated text and pictures. For such a situation, it has recently been shown that teaching learners a physical strategy that enables them to create an integrated format themselves by dragging text to corresponding locations in the picture proves more effective than learning from spatially separated text and pictures. In the present study, we investigated whether teaching learners a mental integration strategy can yield similar results. Participants (n = 87) studied the functioning of an on/off light switch from text and pictures in a spatially separated format using (1) a physical integration strategy, (2) a mental integration strategy (3) no integration strategy, or (4) in a spatially integrated format. Results showed that learners studying an integrated format (recall) or using a mental integration strategy with a spatially separated format (recall and comprehension) outperformed the spatially separated condition that did not use an integration strategy. The integrated and mental integration conditions also obtained higher recall and comprehension scores than the condition using a physical integration strategy in learning from a spatially separated format. Together, these results indicate that when offering an integrated format is not possible to optimize learning from text and pictures, a well-suited alternative is to teach and encourage learners to mentally integrate text and pictures.

Colour harmony in hypermedia: impact on visual attention and implicit memory

Keywords: Emotion and affect, Instructional design, Learning Technologies, Multimedia learning

Presenting Author:Julien Venni, University of Geneva, Switzerland; **Co-Author:**Mireille Betrancourt, University of Geneva, Switzerland

According to recent human-computer interaction theories, instructional interfaces should not only be useful and usable, but also visually attractive and emotionally appealing. However, the research investigating the effect of aesthetics or emotional design on learning outcomes and users' experience provided inconsistent findings, partly because the definition of aesthetics varied across studies. An experimental study was conducted to analyse the influence of a specific feature of aesthetics, colour harmony, on information search performance, subjective evaluation and memory for the content. Participants (N = 34) were asked to perform information search tasks on two version of a website, either with harmonious or disharmonious colours. Results showed that the disharmonious version caused lower subjective ratings for pragmatic qualities but not for aesthetics or attractiveness. Further, eye-tracking data showed that disharmonious colours appeared to distract visual attention, but surprisingly, led to higher memory performances. The findings were interpreted in terms of higher arousal.

Session S 17

16 August 2019 10:15 - 11:45

Seminar Room - S15

Single Paper

Culture, Morality, Religion and Education, Motivational, Social and Affective Processes, Teaching and Teacher Education

Cultural Diversity in Schools

Keywords: Achievement, At-risk students, Content analysis, Cultural diversity in school, Instructional design, Multicultural education, Parental involvement in learning, Pre-service teacher education, Reflection, Second language acquisition, Social aspects of learning and teaching

Interest group: SIG 08 - Motivation and Emotion, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Lenka Schnaubert, University of Duisburg-Essen, Germany

Cultural diversity and Othering: Understanding the dynamics of teachers' discourses

Keywords: At-risk students, Cultural diversity in school, Multicultural education, Social aspects of learning and teaching

Presenting Author:Nikolett Szelei, University of Lisbon, Portugal

This study examined teachers' discourses on cultural diversity in a school cluster in Portugal when talking about students, and its relation to student representation, participation and learning. Most teachers talked about 'foreign students' in the discourse of cultural diversity, however, discursive practices on 'foreigners' were mixed. Reinforcing Othering appeared in labelling and assembling student profiles on the basis of perceived language and migration status, nationality or 'origin', as a contrast to 'Portuguese' students and schools. Following the logic of both difference and sameness, such strategies situated 'problems' within students themselves. On the other hand, discursive practices also seemed to conflict Othering by hesitating to label, identifying structural inequalities and calling on teachers' and schools' moral responsibility to change practice. It is argued that co-existing discourses within the same schooling space might be signs of a 'site of possibility' in transforming for cultural diversity and social justice. However, professional development that fosters collaboration, self-reflection and a critical understanding on cultural diversity is crucial to break the binary of 'us' and 'them' in thought and practice.

A Systematic Review of Chinese-as-an-additional-language Research in Hong Kong from 1997 to 2017

Keywords: At-risk students, Content analysis, Cultural diversity in school, Second language acquisition

Presenting Author:Chun Sum Samuel Tsang, University of Oxford, Hong Kong

In Hong Kong, linguistically and culturally diverse populations have put noticeable strain on the school sector, with Chinese language provision being criticised to be insufficient and often considered a chief cause for limited social mobility of immigrant families and inter-generational poverty. Considering the potential for restoring social justice and narrowing achievement gaps between local and immigrant-origin students across primary and secondary instructional years, research on the teaching and learning of Chinese as an additional language (CAL) is piling up at an unprecedented rate. An integrative scoping review was conducted to provide a state-of-the-art overview of research on Chinese language provision to linguistic minority students in Hong Kong primary and secondary settings from 1997 to 2017; systematic vetting by way of textual analyses was performed to identify 31 studies, which were subsequently coded by topical interests and research approaches. Emerging findings suggest that, despite steady growth over a decade, research into the teaching and learning of CAL is still in its infancy. With the urgency of CAL research in mind, implications for future research avenues are discussed vis-à-vis findings from topical interests and methodological trends from 1997 to 2017.

The effect of child and parental acculturation on immigrant students' academic achievement

Keywords: Achievement, At-risk students, Cultural diversity in school, Parental involvement in learning

Presenting Author:Nanine Lilla, Freie Universität Berlin, Germany; **Co-Author:**Sebastian Thürer, Freie Universität Berlin, Germany; **Co-Author:**Wim Nieuwenboom, Otto Friedrich University Bamberg / FNHW Switzerland, Switzerland; **Co-Author:**Marianne Schuepbach, Freie Universität Berlin, Germany

Thinking tomorrow's education, we figure it is important to address immigrant students' academic success. Acculturation research on immigrant students shows

that their acculturation orientation, i.e. their individual pattern of orientation towards the culture of residence and orientation towards the culture of origin (Berry, 1997) is related to their academic achievement. Focusing on the school context in connection with immigrant youths' acculturation orientation and its effect on academic achievement, parental acculturation has not been taken into account for. Adopting the parent-child-transmission perspective, we hypothesize that parental acculturation orientation is a relevant factor for the emergence of immigrant students' acculturation orientation and their academic achievement. Our findings indicate that the interplay of immigrant students' acculturation orientation and their academic achievement is not limited to the school context, but that parental acculturation orientation also plays a significant role and must be taken into account.

Pre-service Teachers' Learning to Reflect Critically for Culturally Responsive Teaching

Keywords: Cultural diversity in school, Instructional design, Pre-service teacher education, Reflection

Presenting Author:Duygu Umutlu, University of Georgia, Turkey; **Co-Author:**ChanMin Kim, Penn State University, United States

Abstract Reflection is integral to teaching. To be culturally responsive, teachers need to engage in critical reflection. Yet, reaching critical reflection is challenging especially for pre-service teachers with a lack of teaching experience. Scaffolding can help them learn to reflect critically. Being the first iteration of a design-based research study, this multi-case qualitative study explored how culturally relevant case scenarios and reflection prompts scaffolded early childhood pre-service teachers' reflection process. In the study, the three pre-service teachers analyzed four case scenarios that included cultural elements and dilemmas through the guidance from purposefully designed prompts. The findings suggest that their reflection for culturally responsive teaching improved.

Session S 18

16 August 2019 10:15 - 11:45

Seminar Room - S01

Single Paper

Lifelong Learning

Lifelong Learning

Keywords: Cognitive development, Collaborative Learning, Competencies, Instructional design, Interdisciplinary, Language (L1/Standard Language), Lifelong learning, Mixed-method research, Professions and applied sciences, Qualitative methods, Quantitative methods, Student learning, Teaching/instruction, Workplace learning

Interest group: SIG 12 - Writing, SIG 14 - Learning and Professional Development

Chairperson: Frank Hellmich, Paderborn University, Germany

Assessing opportunity recognition competence

Keywords: Mixed-method research, Professions and applied sciences, Student learning, Workplace learning

Presenting Author:Chiara Birk, Ludwig-Maximilians-Universität München (LMU), Germany; **Co-Author:**Susanne Weber, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Christine Kreuzer, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Yvette Baggen, Utrecht University, Netherlands

Innovations become more and more a competitive advantage at workplaces as well as in private lives (BMW, 2018). Individuals have to deal and interact with their dynamic environment. In such dynamic world individuals need to create proactively creative and innovative solutions (Eteläpelto et al., 2013).

Entrepreneurship education scholars and practitioners react on these requirements by developing entre- and intrapreneurship programs to boost this competence. In these programs, opportunity recognition (OR) is a key competence. Within our study, we introduce a tool for assessing this decisive competence. We operationalize a beforehand theoretically created OR competence model (Authors et al. 1) combining it with corresponding performance assessment tools using the validated Opportunity Identification Competence Assessment Test (OICAT) (Authors et al. 2) and the situational judgement test of Shane (2000) as well as some self-formulated open items asking for reasons and reflections. We implemented this comprehensive performance assessment tool in two groups of human resource education students (N=79) on bachelor and master level. We run quantitative and qualitative data analyses and benchmark the results with findings of former studies. First results show that the instrument is able to visualize OR competence. With our approach for measuring OR, we go beyond most existing self-reports and learn on the development and application of assessments for the future. The response patterns give useful insights into crucial facets of opportunity recognition competence for formulating necessary curricular goals and choosing adequate instructional means.

Learning through entrepreneurship: towards alignment in 'wide' entrepreneurship education programs

Keywords: Competencies, Instructional design, Lifelong learning, Teaching/instruction

Presenting Author:Thomas Lans, Wageningen University and Research Centre, Netherlands; **Co-Author:**Judith Gulikers, Wageningen University, Netherlands

Although the number of scientific studies on entrepreneurship education have increased significantly over the last decade, there are only a few studies that explore "wide" entrepreneurship education (EE) systematically: EE is not purely a start-up activity, but a learning process aimed at value creation that is relevant for all age groups. This requires a different perspective on the *what* and *how* of EE. To bridge academic and practical literature on wide EE we conducted a review study including both sources of data using constructive alignment theory as a point of departure. Two research questions were leading in this study: 1) what are exemplary learning outcomes of wide EE (the what question)? 2) what characterises learning activities and environments that aim to contribute to the realisation of these learning outcomes (the how question)? The results of our review suggest that the 'how' question of entrepreneurship education (pedagogy and learning activities) seems to be more important than a meticulous description of the 'what'. Concerning the how question we found that wide EE learning activities and environments that foster learning *through* entrepreneurship have 4 characteristics in common and vary in terms of 11 additional characteristics. These characteristics are further illustrated and discussed as design principles for EEPs in 8 exemplary EEPs in the Netherlands. Implications for EE learning progressions, assessments and teacher professional development for wide EE are discussed.

Measuring task mental models of teams in different domains to capture opportunity recognition

Keywords: Collaborative Learning, Interdisciplinary, Qualitative methods, Workplace learning

Presenting Author:Veronika Anselmann, University of Education Schwäbisch Gmünd, Germany; **Co-Author:**Andreas Widmann, University of Regensburg, Germany; **Co-Author:**Regina Mulder, University of Regensburg, Germany

Working together in teams can enable individuals to recognize opportunities (OR). To stimulate and achieve high team performance at workplaces and in entrepreneurship education programs a common understanding within the team about the work tasks is crucial. Therefore a qualitative design that is able to determine the extent of common understanding is important for measuring OR at team level. However qualitative design is not used yet to get insight into processes in an OR task at team level. Thus the aim is to present two studies which focused on the measurement of task related team mental models (TMM). TMM can be conceptualized as the overlapping shared and organized knowledge and mental representation of knowledge by team members about key elements of their relevant environment. We conducted a study in the domain of vocational education (N = 66 vocational educator teams) and elder care nursing (N = 29 teams). TMM was measured with open questions (study 1) and by using the vignette technique (study 2) on the content of the work tasks. By qualitative content analysis and generalization of the given answers similarity of answers at team level is determined. Results of both studies underline the importance of the consideration of common understanding of their tasks. As OR can be seen as a team task using open questions or vignette technique and analysing the answers according to their semantic similarity by content analysis provide an opportunity to get a deep understanding how teams recognize opportunities.

The right measure? Linguistic development through the lifetime

Keywords: Cognitive development, Language (L1/Standard Language), Lifelong learning, Quantitative methods

Presenting Author:Victoria Johansson, Lund University, Sweden

Linguistic features play a crucial role in the description of writing development. The aim of this paper is to examine some linguistic measures, commonly used to

describe linguistic and writing development, and to investigate how well they describe developmental trends in texts written by first language writers from 10 years old up to advanced adulthood. This study makes use of experimentally collected material where participants of different ages have performed similar and comparable writing tasks, where they were allowed to produce texts on computer for 30 min. The texts are oral ($n=181$) and written ($n=342$) from several genres. The participants are age 10, 12, 13, 15, 17, and groups of adults age 22–45, all writing in their first language. While there is a ceiling effect for text length after adolescence, lexical diversity seems to be the measure that is most steadily linked with linguistic development – it is the only measure amongst the ones chosen that does not demonstrate a decline or a ceiling effect. In addition, a higher lexical diversity is correlated with shorter, and less complex sentences, and this feature is strongly associated with advanced, adult writers. Finally, linguistic competence is demonstrated differently in different genres, and for speaking and writing.

Session S 19

16 August 2019 10:15 - 11:45

Seminar Room - S12

Single Paper

Motivational, Social and Affective Processes

Studies on Motivation Beyond Primary Education

Keywords: Developmental processes, Motivation, Motivation and emotion, Student learning

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Andreas Vorholzer, Justus Liebig University Giessen, Germany

Towards a refined insight in the shifts in adolescents' motivational profiles: A longitudinal study

Keywords: Developmental processes, Motivation, Motivation and emotion, Student learning

Presenting Author: Joachim Waterschoot, Ghent University, Belgium; **Co-Author:** Maarten Vansteenkiste, Ghent University, Belgium; **Co-Author:** Karine Verschueren, KU Leuven, Belgium; **Co-Author:** Bart Soenens, Ghent University, Belgium

Apart from students' level of motivation, also the type matters, as their motives can be rather controlled in nature, such as meeting external demands (external regulation) or bolstering one's ego (introjected regulation) or rather autonomous in nature, such as perceiving the learning materials to be personally relevant (identified regulation) or inherently interesting (intrinsic motivation). Rather unfortunately, a number of studies have suggested a steady decline in children's motivation across primary and secondary school. However, some of these studies are limited because of the use of a cross-sectional designs and the restricted number of motivational subtypes. In the present study, we sought to shed a more refined light on these longitudinal shifts in a group of $N = 463$ adolescents ($M_{age_time1} = 13.37 (3.06)$; 58.96% females), thereby identifying mean-level differences in motivational subtypes and examining whether and in what sense specific motivational profiles shift across a four-year period using Latent Profile Analysis. After LPA returned five different motivational profiles, cross-tabulating the shifts within every pair of waves indicated that adolescents in the good quality motivation profile had the least chance to shift towards the extremely low quantity motivation profile and vice versa. In addition, students in the first group only jumped to adjacent profiles (poor quality and high quantity group). Most of the variation was found for the low quantity group. In terms of profile stability, most students in the high quantitative profile remained stable over time. More advanced analyses will be performed at the time of the conference.

Short-term changes in students' motivations in math-intensive courses and links to academic success

Keywords: Developmental processes, Motivation, Motivation and emotion, Student learning

Presenting Author: Daria Katharina Benden, TU Dortmund University, Germany; **Co-Author:** Fani Lauermann, University of Bonn, Germany

Students' motivation is an important determinant of academic success and persistence in higher education. Drawing on expectancy-value theory (EVT), we examined short-term changes in students' expectancy and value beliefs in demanding math courses that often serve as a gateway to future success in the fields of math and science. Although most studies in EVT have focused on the development of students' motivations over many years, students' experiences in single courses can also play a critical role in shaping their academic success and wellbeing. Accordingly, Study 1 followed students enrolled in three math-intensive study programs across three time points during a single semester at a German university ($N=519$). Study 2 explored the development of students' expectancy-value beliefs and performance across two math courses over the first four weeks of the semester ($N=181$). Study 1 revealed a "motivational shock" from the beginning towards the midpoint of the semester, characterized by a decrease in students' expected success and task values, and a sharp increase in the perceived psychological cost of studying. Study 2 indicated that this "shock" was most pronounced between the second and the third week of the semester, when students received their first performance feedback. The initial motivational shock negatively predicted students' final exam performance and satisfaction with their study program. Importantly, not only the initial levels of motivation, but also the amount of change in students' motivations predicted students' academic success. Gender differences were negligible, whereas students' high school GPA served as a protective factor against the initial shock.

Short-term changes in preservice teachers' intrinsic motivation in an educational psychology lecture

Keywords: Developmental processes, Motivation, Motivation and emotion, Student learning

Presenting Author: Eva Seifried, Heidelberg University, Germany; **Co-Author:** Eva Bosch, Heidelberg University, Germany; **Co-Author:** Birgit Spinath, Heidelberg University, Germany

Previous research on motivation in educational settings has focused on the school sector and longitudinal studies across several years (e.g., Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Musu-Gillette, Wigfield, Harring, & Eccles, 2015). These studies indicate a decline of students' motivation over time. Only recently, also rather short-term longitudinal studies in the higher education sector have gained some attention. These studies indicate that there also is a negative motivational development in university courses (e.g., Kosovich, Flake, & Hulleman, 2017). However, the data reported so far do not shed light on the variety of motivational constructs, the trajectory of the development or possible predictors and consequences of the motivational decline. Addressing these aspects, we analyzed intrinsic motivation among three cohorts of preservice teachers who attended a lecture on educational psychology. $N_{Study1} = 204$, $N_{Study2} = 148$ and $N_{Study3} = 224$ students participated in surveys at five measurement occasions during one semester. In each study, we found that students started with high intrinsic motivation but experienced a motivational drop at the beginning of the semester. In the second study, we found that the non-fulfillment of students' course-specific expectations (i.e., regarding the receipt of handy hints and an overview of the contents of educational psychology) influenced the motivational drop. The third study revealed that the initial motivational drop in turn predicted students' self-imposed goal achievements for the course (i.e., their self-regulated learning). Based on our results, we will discuss means to mitigate the decline of motivation and its consequences in university courses.

Contextual influences on beginning teachers' professional engagement and satisfaction

Keywords: Developmental processes, Motivation, Motivation and emotion, Student learning

Presenting Author: Paul Richardson, Monash University, Australia; **Presenting Author:** Helen Watt, University of Sydney, Australia

Little is known about the malleability of beginning teachers' initial professional engagement and career choice satisfaction in response to early career school contexts. In a longitudinal study (end of teacher education until early career teaching), we examined how initial levels of career choice satisfaction, and professional engagement and career development aspirations (PECDA) changed, and their dependency on school contexts. Participants were $N = 632$ Australian primary/secondary school-teachers from the FIT-Choice project. Self-report surveys tapped PECDA and career choice satisfaction (both timepoints), and school contexts during early career. Highest-rated initially were planned effort and professional development; planned persistence and leadership aspirations somewhat lower. Career choice satisfaction was uniformly high. PECDA factors were low to moderately stable (median $r = .32$), satisfaction $r = .36$. Repeated-measures MANOVA revealed significant declines for all five factors by early career: most for leadership aspirations (more so for primary teachers), then satisfaction, professional development, planned persistence and least for effort. Excessive demands during early career were significantly, although weakly, associated with declining planned persistence, leadership and satisfaction. Other potentially supportive school context factors were considered through the lens

of Self-Determination Theory, emphasising satisfaction of three basic needs (autonomy, competence, relatedness). PECEA and satisfaction change scores were correlated against each context factor. Most associated, were satisfaction and leadership aspirations. The school contexts in which teachers carry out their work, have an important formative role to either erode, or support, levels of professional engagement and career satisfaction during early career for teachers newly transitioning into the workforce.

Session S 20

16 August 2019 10:15 - 11:45

Seminar Room - S14

Single Paper

Learning and Instructional Technology, Motivational, Social and Affective Processes

Educational Psychology

Keywords: Achievement, At-risk students, Cognitive skills, Educational Psychology, Motivation, Peer interaction, Psychometrics, Quantitative methods, Secondary education, Values education

Interest group: SIG 01 - Assessment and Evaluation, SIG 08 - Motivation and Emotion, SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Eva Lindgren, Umeå University, Sweden

Gender Self-concept, Stress, Life Satisfaction, and School Success for New Zealand Adolescents

Keywords: At-risk students, Educational Psychology, Quantitative methods, Secondary education

Presenting Author: Penelope Watson, University of Auckland, New Zealand; **Co-Author:** Valerie Sotardi, University of Canterbury, New Zealand

Confidence in one's *gender self-concept*, has been positively associated with subjective wellbeing, and negative consequences for life at school have occurred for individuals with marginalised gender identities. *Stress* has been inversely related to *life satisfaction*, and life satisfaction (as a key process variable of subjective well-being) has been linked to positive scholastic outcomes. The influence of *gender* on stress, life satisfaction, and academic achievement has been explored but how the latter three factors may be associated with gender self-concept is not known. Importantly, the lowering of social self-concept, and life satisfaction in *adolescence* has rendered gender self-concept especially vulnerable at this time. The current study was conducted with adolescents ($N = 1601$) from seven secondary schools comprising a range of socioeconomic backgrounds and ethnicities, in two major New Zealand urban centres. Data were collected using the Gender Self-concept, Stress, and Coping Questionnaire. After confirmatory factor analysis and confirmatory multi-group factor analysis were conducted, structural equation modelling was performed to explore associations between aspects of gender self-concept, stress, life satisfaction, and academic achievement for adolescent New Zealanders. Gender self-acceptance (contentment with one's own self-defined gender identity), provided a buffer against stress, and predicted increased life satisfaction and academic achievement. In additional models, statistically significant pathways were more prevalent for female and senior students, potentially indicating unique gender identity perspectives for these groups. Implications are suggested for fostering gender-identity safe school environments for adolescents to ensure positive wellbeing and scholastic outcomes.

Parental control as a protective factor for cyber-victimisation in Secondary Education

Keywords: Educational Psychology, Peer interaction, Quantitative methods, Values education

Presenting Author: Trinidad Garcia, University of Oviedo, Spain; **Co-Author:** David Álvarez-García, Oviedo University, Spain; **Co-Author:** Zara Suárez-García, University of Oviedo, Spain; **Co-Author:** Marisol Cueli, Universidad de Oviedo, Spain

The aim of this study is to analyse the relationship between parental control of internet use and being a victim of cyber-aggression in adolescence, as well as the role of impulsivity as a mediating variable. In order to do that we examined the responses of 1913 secondary school pupils in Asturias (Spain) to four validated questionnaires measuring cyber-victimisation, parental control (restriction and supervision), high-risk behaviour, and impulsivity. Correlational and structural equation analyses were performed. The correlational analyses showed a statistically significant relationship between all of the variables except between parental control (restriction and supervision) and cyber-victimisation. Structural equation analysis showed that the relationship between those two variables is mediated by impulsivity and the child engaging in high-risk behaviour. Both restriction and supervision of internet use by parents are protective factors for impulsivity and high-risk internet behaviour on the part of the child. Impulsivity and high-risk behaviour in turn are risk factors for cyber-victimisation in adolescence. These results contribute to a more accurate understanding of the relationship between parental control and cyber-victimisation in adolescence, and support the advisability that families set limits on their children's internet and mobile phone use according to their age and maturity, and supervise that use.

Psychometric Validation of the Grit Questionnaire in a Sample of Adult Distance Education Students

Keywords: Achievement, Educational Psychology, Motivation, Psychometrics

Presenting Author: Kate Xu, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:** Celeste Meijis, Open University, Netherlands; **Co-Author:** Joyce Neroni, Open University of the Netherlands, Netherlands; **Co-Author:** Jérôme Gijssels, Welten Institute Open University of the Netherlands, Netherlands; **Co-Author:** Renate de Groot, Open University of the Netherlands, Netherlands

Grit, the dispositional tendency to sustain trait-level passion and for long-term goals, has raised much research interest and gained importance in particular in terms of promoting student academic performance. The Grit Questionnaire, measuring perseverance of effort (PE) and consistency of interests (CI), has been shown to be a reliable instrument in traditional university student populations. However, the psychometric and predictive validity of Grit is still unknown for distance education (DE) students. Based on a sample of 2,027 DE students from a DE university, using confirmatory factor analysis, the current study psychometrically validated the two-factor structure grit measured by the Short Grit Questionnaire. Contrary to findings in traditional higher education settings, PE was not associated with learning performances. Instead, higher CI positively predicted learning performances in terms of number of courses completed and the likelihood of attempting an exam for a course taken. This novel finding on CI may lie in the characteristics of DE students, who may pursue education based on more diverse reasons such as higher motivation in pursuing a particular course. As such, promoting and maintaining personal interests and motivation might be especially effective for raising learning performances for DE students. However, future studies based on longitudinal data are required in order to better assess a potential reciprocal relationship between grit and performance.

The relationship between problematic smartphone use and students' cognitive lesson avoidance

Keywords: At-risk students, Cognitive skills, Educational Psychology, Quantitative methods

Presenting Author: Arvid Nagel, University of Teacher Education St.Gallen, Switzerland; **Co-Author:** Horst Biedermann, University of Teacher Education St.Gallen, Switzerland

Children and adolescents are currently growing up and living in a so-called age of communication. Smartphones play a key role in people's daily lives – young people are especially attracted to mobile phones. According to the International Telecommunication Union, around 86 percent of people worldwide have access to smartphones. Young people in Germany (and many other European countries) are fully equipped with smartphones. Recent research suggests potential problems due to overuse of mobile devices; digital dependency may result in compulsive and addictive behavior. Indeed, problematic smartphone usage is a contemporary psychological term, but research on mobile dependency is still rare. In order to handle this desideratum, a reliable and valid instrument is essential for the investigation of problematic smartphone usage (in youth).

The aim of our study is to present and validate a measurement model. In particular, the newly developed screening instrument presented here is intended to clarify the question of how the (problematic) use of smartphones affects cognitive lesson avoidance (switching off and dreaming in the classroom) of students – this has not yet been taken into the research view. The following research questions are examined: 1) How can problematic smartphone use be empirically measured? and 2) Can dimensions of problematic smartphone use influence students' cognitive lesson avoidance? As part of a youth study in Switzerland, 1333 lower-secondary students (from 81 school classes) were interviewed, with one in three adolescents providing information on smartphone use and cognitive lesson avoidance.

Session S 21

16 August 2019 10:15 - 11:45

Seminar Room - S04

Single Paper

Instructional Design, Motivational, Social and Affective Processes

Antecedents of Students' Emotions

Keywords: Educational Psychology, Emotion and affect, Higher education, Motivation and emotion, Peer interaction, Primary education, Quasi-experimental research, Reading comprehension, Secondary education, Self-efficacy, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Christine Rubie-Davies, University of Auckland, New Zealand

The impact of TBL on enhancing emotions and learning engagement of university students

Keywords: Educational Psychology, Higher education, Motivation and emotion, Quasi-experimental research

Presenting Author: Lan Yang, The Education University of Hong Kong, Hong Kong

Based on Pekrun's (2006) Control-Value theory of emotions and accumulated evidence, students achievement emotions matter to a wide range of learning outcomes (e.g., motivation to learn, self-regulation of learning, achievement, etc.). However, intervention studies remain scarce in this field. With a sample of Chinese university students, this study extended existing achievement emotion research heavily relying on cross-sectional designs to an experimental design. Enjoyment and hope as two important learning-related emotions were focused. Anxiety and boredom were also included to test the effectiveness of the designed intervention. An instructional intervention by using Team-based Learning (TBL) was administered in four consecutive sessions of a general education course to an experimental class, but not to a control class. Participants were eighty-four students in a Hong Kong university. The results showed students in the experimental class gained more positive emotions (enjoyment and hope), meanwhile significantly reduced more negative emotions (boredom and anxiety) compared to those in the control class. Positive and negative learning-related emotions were positively and negatively correlated with students' engagement in learning, correspondingly. Controlling for students' prior engagement level at pre-test, students' positive emotions had positive effects (but not statistically significant) on post-tested learning engagement. Implications of this intervention on significantly enhancing positive, meanwhile reducing negative emotions in learning are discussed. **Keywords:** TBL intervention, the control-value theory, achievement emotions, university students

Boredom and online multiple-text comprehension in primary school

Keywords: Motivation and emotion, Primary education, Reading comprehension, Self-efficacy

Presenting Author: Daniela Raccanello, University of Verona, Italy; **Co-Author:** Elena Florit, University of Padova, Italy; **Co-Author:** Margherita Brondino, University of Verona, Italy; **Co-Author:** Lucia Mason, University of Padova, Italy

Online multiple-text comprehension is a key skill of the twenty-first century (Rouet & Britt, 2011), but the study of its relations with emotions in young students has been disregarded. A relevant emotion within technological contexts is boredom, an achievement emotion expected to be predicted by antecedents like control and value appraisals and to be associated to a negative performance (Pekrun & Linnenbrink-Garcia, 2014). Notwithstanding its documented domain-specificity, scarce attention has been paid to investigating these relations for reading with young students. In addition, little is known on the moderating role of cognitive abilities like word reading fluency on these relations. Therefore, we examined the relations between reading-related self-efficacy and task-value, reading-related boredom, and online multiple-document comprehension in primary school students, and the moderating role of word reading fluency. The participants were 334 fourth and fifth-graders. We evaluated their reading-related self-efficacy and task-value, reading-related boredom for the homework and test settings, word reading fluency, and online multiple-text comprehension. Through path analyses, we found that for both settings self-efficacy and task-value were negative antecedents of boredom. However, only test-related boredom was negatively linked to online multiple-text comprehension. In particular, only for students with high reading fluency, boredom mediated partially the relation between self-efficacy and online multiple-text comprehension, and fully the relation between task-value and online multiple-text comprehension. These findings can be a basis to 'think tomorrow's education' focusing on motivational, emotional, and cognitive antecedents of critical literacy skills in the twenty-first century. **Keywords:** Motivation and emotion; emotion and affect; reading comprehension; primary education

Effects of learning environments on students' achievement emotions

Keywords: Emotion and affect, Peer interaction, Secondary education, Teaching/instruction

Presenting Author: Lara Forsblom, ISPA-Instituto Universitário, Portugal; **Co-Author:** Francisco Peixoto, ISPA - Instituto Universitário / CIE - ISPA, Portugal

Following Pekrun's (2006) control-value theory (CVT), the present study examines the impact of environmental aspects and teaching behavior on eight different achievement emotions in math classes. Data was collected from a total of 1289 students in 7th and 9th grade from 12 public schools in Lisbon. The environmental aspects and teaching behavior were captured by using three different scales: social support from teachers, social support from peers and perceived choice. The relationships were analyzed using structural equation modelling. Analyses showed that perceived choice and teacher support were positively related to students' enjoyment, hope and pride, and negatively related to students' boredom, hopelessness, anger, anxiety and shame. Perceived choice was most strongly related to students' enjoyment and boredom, whereas teacher support showed the strongest associations with students' anger, hope and hopelessness. Regarding social support from peers the analyses revealed different patterns across the emotions. There were small positive relationships with enjoyment, hope and pride. A small negative effect between peer support and boredom was found, while no significant association with hopelessness was observed. Interestingly results indicated a small positive relationship between peer support and students' shame and anxiety. **Keywords:** Learning environments, teaching behavior, achievement emotions, secondary students

Session T 1

16 August 2019 12:00 - 13:30

Lecture Hall - H11

SIG Invited Symposium

Assessment and Evaluation

SIG 1: Intrapersonal, interpersonal, and situational factors in feedback processing

Keywords: Assessment methods and tools, Content analysis, Experimental studies, Higher education, Pre-service teacher education, Qualitative methods, Self-efficacy, Social aspects of learning and teaching, Social interaction, Student learning, Survey Research

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Jan-Willem Strijbos, University of Groningen, Netherlands

Organiser: Frans Prins, Utrecht University, Netherlands

Organiser: Jan-Willem Strijbos, University of Groningen, Netherlands

Discussant: Frans Prins, Utrecht University, Netherlands

Information about the gap between desired understanding and current understanding is usually the core of theories and models of feedback (e.g., Hattie & Timperley, 2007). One could typify this as a rather cognitive perspective on feedback processing. However, we claim that in order to understand feedback quality, processing, and feedback effectiveness, we should look beyond the cognitive perspective and also take intrapersonal, interpersonal, and situational factors into account when trying to understand feedback processing. That is the aim of the proposed symposium. The four contributions are a mix of theoretical and empirical studies, and they all consider social and/or psychological dimensions of feedback processing. In the first contribution, Aben et al. propose a model

for providing and processing feedback, with an emphasis on the complexity of inter- and intrapersonal factors and errors. The second contribution, of Esterhazy, outlines a research agenda to study conditions for productive feedback from a sociocultural perspective, supported by illustrative examples. In the contribution of Winstone, social dimensions of feedback processing are studied. In two empirical studies she examines whether social dynamics of feedback exchanges may explain memory advantages for evaluative or directive feedback. Finally, the fourth contribution of Prilop et al. connects feedback quality with the psychological construct of self-efficacy. In an empirical study they investigate whether student teachers and experts differ concerning the feedback quality and the feedback self-efficacy quality, using two feedback quality instruments (FQI and FSE). The symposium will address implications for practice as well as promising steps for future studies.

A preliminary feedback provision and processing model

Presenting Author: Jochem Aben, University of Groningen, Netherlands; **Co-Author:** Filitsa Dingyoudi, University of Groningen, Netherlands; **Co-Author:** Anneke Timmermans, University of Groningen, Netherlands; **Co-Author:** Jan-Willem Strijbos, University of Groningen, Netherlands

Feedback is often perceived to be a valuable approach to improve students' learning and performance. Current feedback models share two important similarities in representing feedback processes. First, they either focus on the interplay between feedback processes and interpersonal factors, or on the interplay between feedback processes and intrapersonal factors. By focussing on only one set of factors, these models overlook that both set of factors simultaneously have an impact on feedback provision and feedback processing. Second, current models only implicitly assume that the feedback sender and the feedback recipient have to deal with error identification and error making. Consequently, it is often neglected how and even whether dealing with errors is being considered while providing or processing feedback. In light of these two similarities, a more holistic model for the feedback process is warranted. Therefore, the aim of this contribution to the symposium is to introduce a conceptual model that (1) embraces the conceptual complexity of inter- and intrapersonal factors, and (2) explicitly focuses on errors. As such, the proposed model departs from feedback conceptualised as an error-oriented feedback-process in an interplay with inter- and intrapersonal factors. During the symposium, the model will be explained, applied to practice-based situations and discussed in terms of implications for studying feedback.

Studying productive feedback through a sociocultural lens

Presenting Author: Rachele Esterhazy, University of Oslo, Norway

Higher education teachers often put much effort into designing for productive feedback, but experience regularly that students are not engaging with feedback as intended. This gap between intended and experienced effects of feedback leads to something that has been called 'feedback dilemma'. To understand the dynamics of this dilemma better, it is argued that research needs to focus more on the feedback practices that unfold in situ during a course and the processes and relations that matter for feedback to be productive. Addressing this challenge, this paper outlines a research agenda to study conditions for productive feedback from a sociocultural perspective (Vygotsky, 1978; Wertsch, 1991). At its core lies the idea of productive feedback as a social practice that is achieved in interaction between students, teachers and their environment. This conceptualization carries several methodological implications: First, focusing on practices implies that we need to pay more attention to what students and teachers *do* when engaging with feedback. Second, acknowledging that feedback practices are always situated within specific knowledge domains calls for closer investigation of the discipline-specific context that conditions feedback. Finally, to understand better how we can support productive feedback practices, we need to study pedagogical designs and how these incorporate opportunities for productive feedback to emerge. The remainder of this theoretical paper elaborates on the type of empirical data and methodological approaches that are necessary for addressing these three analytical challenges. The methodological arguments are supported by illustrative examples drawn from several qualitative case studies.

Social dimensions of feedback processing: Memory for 'stern' and 'supportive' performance feedback

Presenting Author: Naomi Winstone, University of Surrey, United Kingdom

Whilst learners typically prefer feedback that identifies directions for future improvement, recent research has demonstrated an evaluative recall bias in feedback processing, whereby past-oriented, evaluative feedback is better recalled than future-oriented, directive feedback. This finding stands in contrast to theories which propose that memory evolved to support planning and future action, and to empirical data demonstrating superior memory for instructions when participants believe they will implement them in the future. This paper reports data testing whether the evaluative recall bias is driven by the social nature of feedback exchanges, where evaluative feedback is perceived as harsher in tone than equivalent directive feedback, thus leaving a stronger memory trace. In the first of two studies, participants were asked to rate the harshness of evaluative and directive feedback comments and, as predicted, evaluative comments were rated as significantly harsher than equivalent directive comments. In the second study, participants read feedback ostensibly given to someone else, in which evaluative and directive comments were either 'supportive' or 'stern' in tone, and were then given a surprise recall test. Contrary to expectation, an evaluative recall bias was evident regardless of the harshness of comments; crucially, when directive comments were framed in a 'stern' way, and evaluative comments in a 'supportive' way, evaluative comments were still better recalled. These findings suggest that memory for performance feedback does not operate in the same way as memory for general future-relevant information. The implications of these findings for our understanding of feedback processing, and for instructional guidelines, are discussed.

Connecting feedback to self-efficacy: Differences between pre-service and expert teachers

Presenting Author: Christopher Neil Prilop, Leuphana University Lueneburg, Germany; **Co-Author:** Kira Elena Weber, Leuphana University Lueneburg, Germany; **Co-Author:** Anna Altmann, University of Freiburg, Germany; **Co-Author:** Matthias Nückles, University of Freiburg, Germany; **Co-Author:** Marc Kleinknecht, Leuphana University Lueneburg, Germany

Feedback plays a vital role in fostering teachers' self-efficacy (Hattie & Timperley, 2007; Tschannen-Moran & McMaster, 2009). Feedback messages can contain several sources of self-efficacy for feedback recipients (Bandura, 1994): verbal persuasions, vicarious experiences, and physiological cues. Therefore, it is of interest to what degree teachers' feedback takes self-efficacy into account and how student teachers and experts differ. Differences of feedback quality were assessed between two student teacher groups (bachelor level: n=30; master level: n=33), and teacher trainers (n=20). Participants provided written feedback for a video-based feedback situation. Written feedbacks were analyzed concerning their general feedback quality using an adapted version of the Feedback Quality Index (FQI; Prins et al., 2006), and their feedback self-efficacy quality (FSE) was evaluated with a newly developed coding scheme. Six categories (criteria, specificity, alternatives, questions, emphasis, first-person) were scored with the FQI, while three categories were assessed with the FSE (verbal persuasion, vicarious experience, physiological cues). One-way ANOVAs of the FQI showed that teacher trainers performed significantly better than bachelor students for specificity, and first-person, and master students for specificity, alternatives, and questions. Student teacher groups did not differ significantly. One-way ANOVAs conducted for the FSE revealed teacher trainers' and master students' feedback contained higher quality verbal persuasions, and physiological cues than the bachelor student group. However, bachelor students' feedback displayed higher quality vicarious experiences than master students. This study indicates training feedback, especially concerning feedback that boosts recipients' self-efficacy, needs to be focused on in university and in-service teacher education.

Session T 2

16 August 2019 12:00 - 13:30

Lecture Hall - H05

SIG Invited Symposium

Motivational, Social and Affective Processes

SIG 8: Emotions in Education: State of the Art, Challenges, and New Directions

Keywords: Assessment methods and tools, Educational Psychology, Emotion and affect, Motivation, Motivation and emotion, Quantitative methods, Self-regulation, Social sciences, Student learning, Teacher professional development, Technology

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Hanke Korpershoek, University of Groningen, Netherlands

Organiser: Hanke Korpershoek, University of Groningen, Netherlands
Organiser: Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany
Organiser: Fani Lauermaun, University of Bonn, Germany
Organiser: Kristina Loderer, Ludwig-Maximilians-Universität, Germany
Discussant: Reinhard Pekrun, Ludwig-Maximilians-Universität, Germany

"Emotions in Education: State of the Art, Challenges, and New Directions"

The past decades of research on emotions in education have shown that emotions can profoundly impact students' learning, academic attainment, and psychological health. Similarly, emotions strongly influence teachers' classroom instruction, well-being, and professional identity. Despite substantial progress, however, there are many more open questions than answers to date. This invited symposium from SIG 8 (Motivation & Emotion) will showcase current advances as well as challenges that need to be met to make headway in this field of research. The four papers address the state of the art and some promising new directions in research on emotions in education.

Which intra-individual methods reveal, or obfuscate, mixed emotions?

Presenting Author: Julia Moeller, Universität Leipzig, Chad

Much of the research on emotions relies on inter- or intra-individual correlations and regressions. If positive correlations or regression coefficients between an emotion E and an outcome O are found, researchers typically assume that experiencing this emotion E is associated with experiencing this outcome O. While this sounds plausible and maybe trivial, it is incorrect: Despite a positive correlation, one or two of the positively associated variables may have been rejected by most, if not all, of the participants (e.g., with "not at all" and "rather not" ratings). But isn't the idea of "mixed emotions" really about co-endorsements, instead of mere covariance? With references to the increasing research on mixed emotions, this presentation introduces intra-individual methods that reveal examine co-endorsements or joint experiences of emotions (e.g., co-endorsement network analyses), and discusses methods that obfuscate such co-endorsements (e.g., many correlation-based analyses and certain z-standardization techniques). The presentation also discusses why the increasingly frequent "within-person" correlations and regressions in multilevel analyses of intensive longitudinal data inherit many of the problems and conundrums of their inter-individual relatives. To compare correlational and other, intra-individual, approaches, this presentation draws examples from different school-based experience sampling method studies on stressful flow experiences, states of motivating anxiety (Pekrun et al., 2002), and the structure of positive and negative emotions in general (Moeller et al., 2018).

Role, function and temporal manifestation of emotion regulation in collaborative learning

Presenting Author: Hanna Jarvenoja, University of Oulu, Finland; **Co-Author:** Tiina Törmänen, University of Oulu, Finland; **Co-Author:** Sanna Järvelä, University of Oulu, Finland

In our research, we have focused on situational and contextual variations in emotion regulation to better understand its appearance and function in regulated learning occurring in collaborative learning situations. In our recent study carried out in secondary school collaborative science lessons (N= 90), we implemented multiple data sources covering group members' subjective emotional experiences, video tapings and physiological reactions during a seven-week study period. Through data triangulation, we can engage in complementary and temporal data analyses to explore co- and socially shared emotion regulation in learning. In the presentation, we will report empirical analysis from this recent study to demonstrate our approach in emotion regulation research. The presentation will be grounded on our theoretical underpinnings on regulation in the collaborative learning process.

Emotions, Self-Regulated Learning, and Advanced Learning Technologies

Presenting Author: Michelle Taub, University of Central Florida, United States; **Co-Author:** Roger Azevedo, University of Central Florida, United States

Emotions, Self-Regulated Learning, and Advanced Learning Technologies: Challenges and Future Directions Emotions play a critical role in learners' ability to monitor and regulate their learning about challenging topics and domains while using advanced learning technologies (e.g., immersive virtual learning environments). Emerging evidence indicates that emotions play a critical role in learning, performance, problem solving, and self-regulation with ALTs, however, capturing emotions during learning with ALTs has been predominantly studied using self-report measures. Unfortunately, self-report measures are limited in many ways that hinder our ability to examine critical issues related to understanding the role of emotions and SRL during learning with ALTs. As such, our presentation will provide a synthesis of research methods used by interdisciplinary researchers to investigate emotions and SRL with ALTs. More specially, our presentation will focus on the following: (1) a brief review of conceptions and definitions of emotions and SRL; (2) a discussion of key issues related to investigating emotions during learning with ALTs (e.g., affective states; learning-centered vs. basic vs. compound emotions; temporal dynamics; the role of cognitive, metacognitive, motivational, and contextual factors that may induce emotions and impede self-regulation; and emotion generation and regulation); (3) a review of the strengths and weaknesses of several interdisciplinary methods including facial expressions, eye-tracking, linguistics and bodily measurements, learner-system interactions, log-files, etc. in relation to issues raised in (2); and, (4) how various methods described in (3) can be converged to augment current conceptual, theoretical, methodological, and instructional issues related to emotions and SRL with ALTs.

Teacher Emotions: Some new evidence from a quantitative research program

Presenting Author: Anne Christiane Frenzel, University of Munich, Germany

Over the past years, empirical inquiry has made considerable progress in understanding the nature, antecedents and consequences of teachers' emotions, but quite some questions still seem unresolved. Much of the presented research is based on a brief self-report scale for the assessment of teacher enjoyment, anger and anxiety we developed (Frenzel et al., 2016). Our most recent data also involves facial expressions of teachers' emotional experiences in class using automated coding of field video data (Frenzel et al., 2019).

Key findings of this research program include that teacher enjoyment and anger are quite pervasive among teachers, and anxiety is comparably low in frequency, yet not irrelevant. Furthermore, teacher enjoyment, anger and anxiety are (1) clearly separable from one another, (2) systematically linked to, but clearly empirically separable from general affect, burnout, or teaching self-efficacy, (3) systematically linked to student-perceived teaching behaviors, and (4) highly context-specific. Specifically, the group of students taught, and the quality of the relationship with the group, are closely tied to teachers' emotional experiences. Finally, we could show that (5) teacher enjoyment can transmit to students – and back from students to teachers (Frenzel, et al., 2018); and (6) teacher emotions have a "felt" and a "displayed" component, which do not necessarily converge within individual teachers (Taxer & Frenzel, 2017). Those teachers who display more enjoyment on the outside than they actually feel on the inside demonstrated poorer wellbeing. Implications for educational practice are discussed.

Session T 3

16 August 2019 12:00 - 13:30

Lecture Hall - H10

Symposium

Learning and Social Interaction

Systematic classroom observations

Keywords: Arts, In-service teacher education, Motivation, Motivation and emotion, Peer interaction, Pre-service teacher education, Social aspects of learning and teaching, Social interaction

Interest group:

Chairperson: Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Organiser: Tuomo Virtanen, Norway

Discussant: Lars-Erik Malmberg, University of Oxford, United Kingdom

Evidence shows that teacher–student interactions in the classroom are more important to explain student achievement and engagement than, for example, teachers' qualifications and experience, or the curriculum. This symposium is organized to deepen researchers' understanding on the role of teacher–student interactions in enhancing child and early adolescent classroom engagement and discuss the role of systematic observations in educational research. The first paper (Cadima, Alvim, Aguiar, Guedes, Aguiar, & Barata) examines the association between Portuguese teachers' interactions and toddlers' (mean age = 31 months) engagement with arts-related activities. Furthermore, the quality of individual child engagement with teachers, peers and tasks is investigated. The second paper (Pakarinen, Lerkkanen, & von Suchodoletz) examines 6-year-olds children's task-related behaviors in Finnish kindergarten classrooms. The third paper (Ertesvåg & Vaaland) investigates the associations between teacher-student interactions (teacher-reported and observed) and observed student engagement in Norwegian lower secondary school classrooms. Moreover, how classroom interactions are related to teachers' perception of school organizational factors and well-being is examined. The fourth paper (Klette, Blikstad-Balas, & Roe) discusses how systematic classroom observations could provide reliable and qualified information about instructional practices, describe specific patterns and strengths in classroom interactions, work as a diagnostic tool for more systematic work on targeted instructional elements, and contribute to in-service and pre-service teacher professional development. The four papers presented in the symposium contribute to the knowledge base on the associations between teacher–student interactions and student engagement. Theoretical and practical implications of the use of systematic classroom observations will be discussed.

The quality of interactions in arts-related activities

Presenting Author:Joana Cadima, University of Porto, Portugal; **Co-Author:**Mafalda Alvim, University of Porto - Portugal, Portugal; **Co-Author:**Teresa Aguiar, Faculty of Psychology and Educational Sciences, University of Porto, Porto, Portugal, Portugal; **Co-Author:**Carolina Guedes, University of Porto, Portugal; **Co-Author:**Cecília Aguiar, ISCTE - Instituto Universitário de Lisboa, Portugal; **Co-Author:**Clara Barata, University of Coimbra, Portugal

In this study, we examine specific features of arts-related activities in crèche and its associations with the quality of group-level teachers' interactions and the quality of individual child engagement with teachers, peers and tasks. Participants were 31 toddler classrooms and 50 toddlers (Mage = 31 months, SD = 4.12). At the classroom level, the quality of teachers' interactions was observed with the CLASS Toddler (La Paro, Hamre, & Pianta, 2012) that includes both aspects of Emotional/behavioral support and Engaged support for learning. The inCLASS (Slot, Bleses, & Downer, 2016) was used to observe levels of child engagement with teachers, peers and tasks. Results showed that several activity features, namely, kind of adult involvement, the use of hands-on materials, social grouping of the activity and open-ended, were associated with the levels of process quality at the group level, particularly with the Emotional and Behavioral Support domain. Child engagement with teachers and tasks also covaried with several features. Results highlight the importance of levels of adult involvement, hands-on materials, small group delivery, and open-ended activities to improve the quality of interactions at the group and children's engagement during arts-related activities.

The quality of teacher-child interactions in relation to task-focused behaviors

Presenting Author:Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland; **Co-Author:**Antje von Suchodoletz, New York University Abu Dhabi, United Arab Emirates

Teacher-child interactions in the classroom are among the most important factors in promoting children's social-emotional and academic outcomes. However, less is known about to what extent the quality of teacher-child interactions is associated with children's task-related behaviors in kindergarten. The present study aimed to investigate the cross-lagged associations between the quality of teacher-child interactions and children's task-focused behaviors. The data of the present study were drawn from the Teacher Stress Study (TESS). Teacher-child interactions were video-recorded in 49 kindergarten classrooms during normal school hours twice across the kindergarten year (fall and spring). Trained observers rated the quality of teacher-child interactions with Classroom Assessment Scoring System (CLASS Pre-K). Children (n = 495; 6-year-olds; 51% boys) were rated twice by their teachers on their typical behaviors in learning situations. The results of multilevel modeling indicated that high-quality emotional support was related to more subsequent task-focused behaviors typical of the classroom. There was a bidirectional link between task-focused behavior and classroom organization: task-focused behavior typical of the classroom was related to higher subsequent quality of classroom organization and classroom organization increased task-focused behaviors. The results emphasize the importance of high-quality teacher-child interactions for promoting children's school engagement and task-focused behaviors.

Observed and teacher perceived classroom interactions

Presenting Author:Sigrun K. Ertesvåg, University of Stavanger, Norway; **Co-Author:**Grete Sørensen Vaaland, University of Stavanger, Norway

This paper investigates teachers' self-reported and observed teacher-student interaction quality (emotional support, classroom organization, and instructional support) and the associated observed student engagement, teachers' perception of school organizational factors and well-being. The sample contained 79 lower secondary teachers and a classroom they were teaching (1650 students). The teachers reported on a web-based questionnaire in the beginning and the end of one academic year. In addition, classrooms were observed four lessons throughout the year. The observations were scored on 12 dimensions using Classroom Assessment Scoring System-Secondary (CLASS-S). Moreover, teachers and students reported on a web-based questionnaire at the beginning (T1) and the end (T2) of the school year containing scales on three aspects of teacher-student interaction quality, school organizational factors, teachers well-being and teacher demographics. A latent profile analysis (LPA) approach to the variations in the quality of classroom experiences in Norwegian lower secondary schools identified three subgroups among the classrooms identified as consistently high (high scores on both observations and self-reports) (51%), inconsistent (self-underestimating) (32%), and consistently low (low on both observation and self-reports) (18%). Findings indicate an association between profile membership and student engagement, school organizational factors and teacher well-being.

Observation manuals as lenses into classroom teaching and learning

Presenting Author:Kirsti Klette, University of Oslo, Norway; **Co-Author:**Marte Blikstad-Balas, University of Oslo, Norway; **Co-Author:**Astrid Roe, University of Oslo, Faculty of Education, Norway

This paper report from the use of a subject specific coding manual - the Protocol for Language Arts Teaching Observation (PLATO) in Norwegian lower secondary classrooms. Drawing on video recordings from 46 Language Arts classrooms and 48 Mathematics classrooms (n=396 lessons) we show how coding manuals serve multiple interpretations; (i) provide reliable and qualified information about instructional practices in Norwegian mathematics and LA classrooms; (ii) give an overview of specific patterns and strengths; (iii) serve as a 'diagnostic tool' for systematic work on targeted instructional elements (e.g. Feedback, Strategy Instruction, Classroom Discourse), and (iv) last but not least; could work as a platform for professional development activities (in-service and pre-service activities). As such, coding manuals serve multiple functions – for empirical validation of instructional practices, as a diagnostic tool, and as a common language for investigating classroom teaching and instruction.

Session T 4

16 August 2019 12:00 - 13:30
Lecture Hall - H06 - Amazon Hörsaal
Symposium
Assessment and Evaluation

21st century technology-based formative and summative assessments in higher education

Keywords: Assessment methods and tools, Case studies, Educational technology, Higher education, Learning Technologies, Peer interaction, Pre-service teacher education, Problem solving, Quantitative methods, Social aspects of learning and teaching, Student learning, Survey Research, Technology

Interest group: SIG 04 - Higher Education

Chairperson: Sonja Franziska Christina Wenzel, Goethe-Universität Frankfurt, Germany

Chairperson: Christian Spoden, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany

Discussant: Detlev Leutner, University of Duisburg-Essen, Germany

Assessments are core elements in higher education to provide information to support students' learning processes and educational development, to assess

students' content knowledge within specific domains and broader competencies considered to be important for study success, or to justify high-stake decisions in the course of studies. While the age of paper-pencil assessments passes by, digital technologies offer innovative options for the assessment of studies-related skills, characterized by immediate feedback on performance and response behavior (by analyzing log data), and enhanced measurement precision. Thus, the symposium aims to demonstrate the capability of implementing 21st century technology-based assessments in higher education to foster students' learning and outline challenges related to its implementation. The four papers of this symposium achieve this aim by illustrating examples from the assessment of complex, 21st century skills of students (Pöysä-Tarhonen, Häkkinen, Näykki, & Järvelä; Molnár & Csapó), refining a promising framework for adaptive formative assessments (Krille, Wenzel, Bengs, Kröhne, Fabriz, Libbrecht, Goldhammer, & Horz), and investigating characteristics of university instructors concerning application of technology-based summative assessments (Fink, Spoden, Born, & Frey). The symposium addresses researchers interested in empirical evidence on effects of technology-based assessments and enables a discussion on its benefits in contrast to conventional testing. It also addresses researchers who regularly provide advice to university instructors in terms of how to implement assessment methods with digital technologies in higher education and invites researchers from the audience to share their experiences on how to arrange this implementation in a favorable manner for different stakeholders.

Relationship between students' matriculation examination results and problem-solving competencies

Presenting Author:Gyongyver Molnar, University of Szeged, Hungary; **Co-Author:**Benő Csapó, University of Szeged, Hungary

There are two main traditions for selecting students for higher education: using their high school results and assessing their knowledge and aptitudes. In this study, we explore the relationship between these two possibilities. High school performance is represented by results on the matriculation examination and assessments of students' aptitudes with a dynamic problem-solving (DPS) test. DPS may represent students' abilities to succeed in higher education, as tasks used for assessing them involve knowledge acquisition, rule induction and rule application. We analyse how the matriculation examination predicts students' DPS level at the beginning of their studies. The analyses include results from four data collection events conducted between 2015 and 2018. Participants were first-year students at a major Hungarian university (n=7649). The computer-based DPS test was based on the MicroDYN approach. Cronbach's alpha ranged from .88 to .90. The mathematics matriculation result predicted problem-solving more strongly than the other two compulsory subjects; however, the predictive power dropped from $r=.414$ to $.286$ over time ($z=4.35$, p

Development of a formative adaptive assessment and implications for its use in teacher education

Presenting Author:Claudia Krille, Goethe University Frankfurt, Germany; **Co-Author:**Sonja Franziska Christina Wenzel, Goethe-Universität Frankfurt, Germany; **Co-Author:**Daniel Bengs, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Ulf Kroehne, DIPF, Germany; **Co-Author:**Sabine Fabriz, Goethe-Universität Frankfurt, Germany; **Co-Author:**Paul Libbrecht, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Holger Horz, Goethe-University Frankfurt, Institute of Psychology, Germany

Because of their flexible accessibility, digital technologies are an up-to-date possibility to enrich settings of teaching and learning. Especially in higher education, when university teachers are confronted with large and heterogeneous student groups, the use of information and communication technologies can be fruitful. For example, they can enhance assessments due to more flexibility regarding where and when students take an assessment, as well as the immediate scoring of student answers and generation of feedback based on students' performance. Due to the automatic and immediate assessment, computer adaptive testing can be realized, providing an individual test for each student based on his / her course of test performance. The current paper aims at describing the development of a computer adaptive test (CAT) for teacher students within a lecture on pedagogical knowledge. The development process is guided by the steps suggested by Thompson and Weiss (2011). Following their framework, the paper presents the rationale for using a CAT for formative assessments, describes how an appropriate item pool was developed and calibrated, and how the CAT is specified based on the final 104 items. Results from the hybrid simulations are reported and discussed. As a final step, the CAT is currently published. In order to evaluate the final CAT as formative assessment, a pre-post-test design using different questionnaires is realized and additional log data are analyzed.

Online assessment of collaborative problem solving in pairs: Skill levels and quality of interaction

Presenting Author:Johanna Pöysä-Tarhonen, University of Jyväskylä, Finland; **Co-Author:**Päivi Häkkinen, University of Jyväskylä, Finland; **Co-Author:**Piia Naykki, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

The assessment of collaborative problem-solving (CPS) skills have mainly focused on the outcomes of the individuals as social and cognitive skill levels instead of analysing the interaction processes leading to those outcomes. However, it is expected that the quality of interaction and the individuals' abilities to solve the tasks intermingle. To better understand CPS construct in online context, this study examines individual students' CPS skills and their relation to the quality of interaction processes during CPS task completion in the ATC21S assessment environment in pairs, who score differently in the CPS tasks. In the study, students with diverse CPS skill levels tend to organize themselves differently in accordance to their partner and the task when they solve problems together. Consequently, deeper understanding of the indicators related to high-quality CPS processes is essential if we want to better support the students in developing these skills as well as in terms of validating the CPS construct for assessment.

Testing an explanatory model for the intention to use e-exams by the university teaching staff

Presenting Author:Aron Fink, Goethe University Frankfurt, Germany; **Co-Author:**Christian Spoden, German Institute for Adult Education - Leibniz Centre for Lifelong Learning, Germany; **Co-Author:**Sebastian Born, Friedrich-Schiller-University Jena, Germany; **Co-Author:**Andreas Frey, Goethe-University Frankfurt, Institute of Psychology, Germany; **Co-Author:**Hanna Köhler, Friedrich-Schiller-University Jena, Germany

Relying on previous technology acceptance and computer-based assessment acceptance models, an explanatory model for the intention to use conventional and adaptive e-exams by university teaching staff members was proposed and afterwards tested by means of structural equation modeling. The estimated model comprised the perceived usefulness of e-exams as well as computer-related variables (self-efficacy, anxiety) and beneficial general conditions (like a sound IT infrastructure) as predictors for the intention to use e-exams. The results highlight the importance of the perceived usefulness of e-exams as the key predictor while media-related measures had indirect effects on the intention to use the assessments, mediated by the media usage in lectures. Effects on adaptive e-exams were slightly stronger than on conventional e-exams. The importance of individual attitudes in comparison to hardly influenceable external conditions for predicting the intention to use (adaptive) e-exams is emphasized in the discussion.

Session T 5

16 August 2019 12:00 - 13:30

Lecture Hall - H07

Symposium

Instructional Design

How to Optimize Retrieval-Based Learning?

Keywords: Computer-assisted learning, Educational Psychology, Experimental studies, Instructional design, Metacognition, Teaching/instruction

Interest group: SIG 06 - Instructional Design

Chairperson: Julian Roelle, Ruhr-University Bochum, Germany

Organiser: Julian Roelle, Ruhr-University Bochum, Germany

Discussant: Elisabeth Stern, ETH Zurich, Switzerland

Engaging in retrieval practice can substantially promote learning outcomes. This proposition is supported by a wealth of research on retrieval-based learning (also referred to as test-based learning). Nevertheless, retrieval-based learning is not always equally effective; rather, its effectiveness depends on various factors. The aim of this symposium is to extend our knowledge regarding these factors and thus contribute to further optimizing the retrieval-based learning approach. Contribution 1 investigates whether the benefits of providing learners with specific test questions (practice quizzing) can be enhanced by adapting the

test questions to learners' subjective cognitive load. In Contribution 2, the effects of four different retrieval practice tasks (e.g., practice quizzing or test-generation) are compared; furthermore, the role of learner characteristics such as working memory capacity and motivation for the effects of the retrieval practice tasks free recall and test-generation is explored. Contribution 3 also deals with the effects of test-generation. The authors analyze whether the benefits of asking learners to generate and answer test questions can be increased by requiring learners to engage in retrieval practice during this activity. Finally, Contribution 4 analyzes learners' knowledge regarding the benefits of test-based learning. Specifically, the authors investigate whether the well-known finding that learners seem to underestimate the benefits of testing (which might prevent learners from engaging in it) is due to a negative feedback effect of testing. The different theoretical perspectives and the sound design of the experiments indicate that the symposium will point to fruitful conclusions concerning research on retrieval-based learning and educational practice.

Adaptive Testing Increases the Testing Effect

Presenting Author:Svenja Heitmann, Ruhr-Universität Bochum, Germany; **Co-Author:**Axel Grund, University of Bielefeld, Germany; **Co-Author:**Kirsten Berthold, University of Bielefeld, Germany; **Co-Author:**Stefan Fries, University of Bielefeld, Germany; **Co-Author:**Julian Roelle, Ruhr-University Bochum, Germany

Providing learners with test questions (i.e., *test-based learning* or *testing*) is a common means to foster learning. In the present study, we investigated whether an adaptive approach based on learners' perceived cognitive load when working on the provided test questions would increase the beneficial effects of testing found in past research. The present study examined the learning of $N = 182$ university students in three conditions: (a) *adaptive testing*, (b) *non-adaptive testing* and (c) *note-taking*. Our aims were (1) to investigate if adaptive testing is more beneficial than non-adaptive testing and (2) to replicate previous findings which show that testing does not only yield better results than the usual restudy control condition but also than the stronger control condition note-taking (*testing effect*). We succeeded in replicating the testing effect (non-adaptive testing vs. note-taking), which provides further evidence of the high educational utility of testing. More importantly, we found that testing yielded even better results when the test questions' complexity was adapted to learners' perceived cognitive load. These findings indicate that providing adapted test questions is a promising means to optimize testing.

Examining the Role of Students' Individual Differences in Retrieval-Based Learning

Presenting Author:Christine Bae, Virginia Commonwealth University, United States; **Co-Author:**Jenni Redifer, Western Kentucky University, United States; **Co-Author:**Christopher Rivera, Virginia Commonwealth University, United States

The aims of this study were to examine different forms of retrieval-based learning among college students in the United States, and to explore how individual differences in students' cognition and motivation interact with the effectiveness of the various forms of retrieval-based study strategies. Findings showed that in addition the traditional free-recall form of retrieval-based study, practice quizzing and test-generation also showed to be effective. Additionally, the cognitive (working memory, IQ) and motivational (task value, intrinsic motivation) characteristics that students bring to bear showed to interact significantly with the effectiveness of these various retrieval-based learning strategies. Theoretical and educational implications of the findings are discussed.

The Effects of Generating Test Items with Closed-Book or Open-Book on Retention

Presenting Author:Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:**Tino Endres, University of Freiburg, Germany; **Co-Author:**Ellen Van Dijk, University Utrecht, Netherlands; **Co-Author:**Alexander Renkl, University of Freiburg, Germany; **Co-Author:**Tamara Van Gog, Utrecht University, Netherlands

Generating test questions and answers to those questions is a common instructional strategy in educational practice. There is a paucity of research on the effects of this strategy, so it is an open question whether and under which conditions generating test items improves learning outcomes. The present experiment investigated whether the effects of generating test questions and answers on retention would depend on whether the test items are generated while the materials are available (open-book) or not (closed-book). In prior research, students were almost without exception instructed to generate the test items in an open-book format. However, based on the retrieval practice effect, one would expect a closed-book format to be more effective for retention. Secondary education students ($N=58$) first studied a prose passage and then generated open-ended test items with (Open-Book Condition) or without access to the text (Closed-Book Condition). They completed a retention test one week later and effects on invested mental effort were explored. Results showed that the Closed-Book Condition invested more effort in generating the test items than the Open-Book Condition. However, this additional effort investment did not pay off: The Open-Book and Closed-Book Condition did not differ in terms of performance on or effort invested in completing the retention posttest. These findings are surprising in light of the retrieval practice effect. We plan to score the quality of the generated questions and to conduct an additional experiment to shed further light on the effects of open vs. closed question generation on learning outcomes.

Do Learners Know More About Learning Than we Think? Metacognitive Studies on the Testing Effect

Presenting Author:Sophia Christin Weissgerber, University of Kassel, Germany; **Co-Author:**Ralf Rummer, University of Kassel, Germany

Metacognitive assessments of testing's long-term effectiveness are often underestimated in favor of repeated reading. Yet the circumstances under which metacognitive assessments, usually termed judgments of learning, are made are of importance. So far, these meta-cognitive judgments have been measured mostly during or after the execution of the learning activity. One may however presume a bias in the metacognitive judgments due to a negative feedback effect of the testing activity, e.g. showing one's knowledge gaps. It is unlikely that students consider rereading to be more effective than reading + testing. In two experiments, we eliminated the feedback effect by asking participants to merely imagine the learning activity (2 levels: rereading vs. testing). We captured Predicted Retention Outcomes (= PROs) as a function of an imaginary retention interval (3 levels: 5 min, 1 week, 2 weeks). While Study 1 manipulated learning activity between subjects and retention interval within subjects, Study 2 manipulated both factors within subjects. We currently plan a third experiment as full between subject design. The results of Study 1 and Study 2 both show higher PROs of testing over rereading for longer retention intervals. Students' metacognitive assessments thus seem more accurate than previously assumed: The PROs as a function of retention interval and learning activity mimic closely laboratory data on actual short and long-term retention with the same materials. Theoretically, our findings support the distinction between theory- and experience-based judgments, according to which theory-based judgments rely on knowledge about the temporal course of forgetting.

Session T 6

16 August 2019 12:00 - 13:30

Lecture Hall - H09

Symposium

Lifelong Learning

Learning in internships and learning through practice – crucial aspects of professional development

Keywords: Higher education, Informal learning, Inquiry learning, Lifelong learning, Out-of-school learning, Vocational education, Workplace learning

Interest group: SIG 14 - Learning and Professional Development

Chairperson: Christian Harteis, University of Paderborn, Germany

Discussant: Hans Gruber, University of Regensburg, Germany

Much research on education in the professions focuses learning (and instruction) in educational institutions. However, it is also common knowledge that crucial contributions to individual competence development come from learning through of work and practice. In consequence, many educational programs aim at integrating practice settings in order to improve their efficacy. One of the central findings is that those individuals who engage in individual learning or in efforts to develop their work environment are doing so intentionally. Far less is known about implicit learning processes in practice contexts and how these may be aligned with organizational goals and goals of educational programs. This symposium comprises contributions that investigate learning in practice settings in various disciplines and various educational contexts.

Ready to learn in the workplace? Workplace learning readiness in the context of dual learning

Presenting Author:Piet Van den Bossche, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium; **Co-Author:**Eva Kyndt, KU Leuven (BE), Belgium; **Co-Author:**Bart Wille, Ghent University, Belgium; **Co-Author:**Jetje deGroof, Antwerp University, Belgium

Although research and policy acknowledge the importance of including individual student factors in organising learning through the practice of work, we lack a clear definition of what it entails to be 'ready' for workplace learning. The aim of this paper is to identify the different dimensions underlying workplace learning readiness and their indicators. The study took place in the context of the preparation of a new system for dual learning in Flanders in which 60% of the learning in vocational education will take place in the workplace. The study was divided in three phases. A literature review and document analyses of (good) practices across the world in a first phase; a second phase in which semi-structured interviews with 10 teachers and 10 mentors that participated in a pilot project in the preparation phase of the new dual learning system were conducted; and a third phase in which a member check with teachers, mentors and students took place. Three clusters of important dimensions that are relevant when discussing students' workplace readiness were identified: (1) dimensions related to students motivation for dual learning, (2) dimensions that are important for students to be able to participate in the work-process and, (3) dimensions that are important in order to be able to learn in the context of work. Our results indicated that sectors, workplaces and schools differ in their willingness and capacity to support students in developing these three dimensions.

Internships in dual higher education – learning and working tasks at the workplace

Presenting Author:Alexander Brodsky, University of Mannheim, Germany; **Co-Author:**Juergen Seifried, University of Mannheim, Germany; **Co-Author:**Gerald Sailmann, Hochschule der Bundesagentur für Arbeit, Germany

Dual higher education programs combine studies at universities/colleges with in-company work experiences. Many of these programs promise graduates who are well prepared to enter the labor market. Especially the practical periods embedded in the structure of these programs are regarded as a crucial factor in preparing students for the requirements of the labor markets. At the current state of research, little is known about the effects and benefits of workplace learning in higher education and its influence on the development of the students' competencies. Hence, we analyze workplace learning during internships of a dual bachelor program by documenting job tasks with the help of learning diaries. Furthermore, we survey additional factors such as the students' prerequisites and expectations (at the beginning of the internship), working and learning conditions at the workplace, and the perceived development of the students' competencies (evaluation at the end of the internship). First results show that the students mostly observe colleagues at the beginning of their internship. Although observing colleagues was dominant, the share of self-performed tasks increased slowly during the duration of the internship. Both observations and self-performances are ascribed a high learning potential, although the results indicate a higher learning potential in cases of self-performances. While several task characteristics influence the perceived learning potential, the strongest predictor for both observations and self-performances is the interestingness of the task.

Enriching learning through practicums: post-practicum interventions in higher education

Presenting Author:Stephen Billett, Griffith University, Australia

This paper offers a range of insights about the processes and outcomes of enriching higher education students' learning through post-practicum interventions. That is, using these interventions to augment students' learning experiences from their practicums and integrate them into their program of study. Work placements and their integration are now becoming essential elements of higher education programs. This is to help students secure capacities that will assist them become employable and be productive in that employment beyond their graduation. Just providing work placement experiences alone is insufficient. To optimise student learning it is also necessary to assist students draw upon, utilise, elaborate, reconcile and extend what they have learnt through their workplace experiences with the goals of their higher educational programs. The processes and outcomes of such interventions presented here are from approximately 20 projects across a range of disciplines in Australian universities that trialled and evaluated different approaches to enriching these learning experiences. Central here was an alignment between the kind of goals to be achieved and the processes enacted. Also, salient here were activities that were authentic in terms of the kinds that they encounter in work settings, and their alignment with practice considerations. Diverse kinds of enrichment processes were enacted and evaluated, with different kinds of student outcomes. Yet, the key finding was the importance of how students came to participate in these activities. The alignment between students' interests and imperatives was a key basis for successful interventions, and education provisions need to be mindful of them.

Cognitive Styles and Person-Environment Fit in the Context of Work-Based Learning Experiences

Presenting Author:Petri Nokelainen, Tampere University, Finland; **Co-Author:**Heta Rintala, Tampere University of Technology, Finland; **Co-Author:**Laura Pylväs, University of Tampere, Finland

Previous research has shown that workplaces vary as learning environments, some providing opportunities for developing expertise, while others restrict the possibilities of learning. In addition to such environmental factors, individual learner factors, such as previous experience, knowledge and understanding of learning opportunities, engagement in activities and motivation, affect one's ability to both identify and utilise available learning conditions (Ellström, Ekholm, & Ellström, 2008). In this study, we utilise Adaption-Innovation theory (Kirton, 1976), focusing on the presage component of the 3-P model (Tynjälä, 2013), to compare Finnish school-based ($n=911$) and apprentice ($n=270$) students' cognitive styles and person-environment fit in the context of their (RQ1) experiences of the interplay between theory (VET studies) and practice (on-the-job training, work-based learning) and (RQ2) satisfaction with the VET courses, teaching and guidance. Results indicated that both school-based and apprentice students with an adaptive cognitive style had received more learning resources that are relevant in the working life from their VET studies than innovative students. Apprentices' cognitive style matched the cognitive style of their environment better than school-based students.

Session T 7

16 August 2019 12:00 - 13:30

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Teaching and Teacher Education

Supporting teachers' evidence-based practice: prerequisites, instructional approaches and educators

Keywords: Argumentation, Attitudes and beliefs, Educational Psychology, Higher education, Mixed-method research, Pre-service teacher education, Synergies between learning teaching and research, Teacher professional development, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Katharina Kiemer, Universität Augsburg, Germany

Organiser: Katharina Kiemer, Universität Augsburg, Germany

Discussant: Karen Könings, Maastricht University, Netherlands

Evidence-based teaching in the Anglo-American tradition (Slavin, 2008) refers to the notion that service teachers ought to employ such teaching strategies that have been researched empirically and evaluated positively. However, there is growing scientific discourse on evidence-based teaching as the practice of using scientific research findings and theories to inform practice, instead of subjective theories and everyday-knowledge (Bromme et al., 2014; Groß Ophoff et al., 2015; Stark, 2017). For both perspectives on evidence-based teaching, research has shown deficits in pre-service teachers: they often rely on every-day explanations or subjective theories and use experiential knowledge; they cling to misconceptions and unfavourable beliefs (Knight, 2015; Richardson, 1996; Schildkamp & Kuiper, 2010), also they hold unfavourable motivational orientations and attitudes towards research on learning and instruction (Parr & Timperley, 2008). This symposium addresses the question how university-based teacher education can tackle these shortcomings and facilitate pre-service teachers' attitudes and competences towards evidence-based practice. The first contribution focuses on how pre-service teachers' core beliefs as prerequisites longitudinally affect their evidence-based practice. The second contribution investigates pre-service teachers' reasoning processes under a script perspective and tests activity prompts as a way to scaffold them in evidence-based teaching. Contribution 3 presents an integrative learning environment and investigates in a 2x2 experimental design the effects of different collaboration scripts for evidence-based explanations of a classroom problem. The last contribution shifts the

focus to teacher educators and investigates their role as brokers for evidence-based practice in teachers. The session will close with a discussion by Karen Könings.

An investigation into early career teachers' core beliefs about teaching, knowledge and ability

Presenting Author:Leila Ferguson, Kristiania University College, Norway

Teachers are tasked with preparing students to become lifelong learners that are equipped to participate in multi-faceted knowledge communities and to tackle a changing world. To achieve this, teachers are required to synthesize and use different knowledge sources rather than reproducing practices from a time before the digital era. Teachers' beliefs shape their practice and interactions with students. We therefore approach this challenging reality by focusing on core teacher beliefs about teaching, knowledge and ability, and relating these to teachers' reflections about their practice. (Pre-service) teachers were asked to reflect about their practice and underlying beliefs were inferred. Although pre-service teachers were interested in building bridges between theory and practice, they were, in many cases, unable to fathom how this should be done. This study follows up early career teachers two years on. Implications for teacher education and theory are drawn.

Pre-service teachers' evidence-based reasoning: appearance, benefits and ways of support

Presenting Author:Katharina Kiemer, Universität Augsburg, Germany; **Co-Author:**Ingo Kollar, University of Augsburg, Germany

Studies show (pre-service) teachers' inaptitude to address pedagogical problems by aid of scientific research. One reason might be teachers' insufficiently developed cognitive scripts for tackling classroom problems in such a way. We investigated (1) whether beginning and advanced pre-service teachers differ in their cognitive scripts for tackling pedagogical problems, (2) to what extent these scripts are influenced by attitudes towards educational research, and (3) to what extent they predict pre-service teachers' application of scientific theories to a classroom problem. Participants were 103 beginning and 236 advanced pre-service teachers, who wrote two case analyses of a presented classroom problem. The first case analysis was unguided, the second supported by activity prompts. Students' case analyses were assessed with respect to the extent to which they included references to scientific theories (ICC=.89). Also, participants were asked to reconstruct the process of their analysis by selecting activities they felt they had engaged in from a pre-defined activity list. Results point at differences between beginning and advanced students' scripts: Advanced students identified problems significantly more than beginning students, while at the same time engaging significantly less in goal-setting. More developed scripts resulted in significantly more application of scientific theory to the problem. Surprisingly, activity prompts did not foster the use of scientific theory. Thus, even though pre-service teachers' cognitive scripts for tackling pedagogical problems are predictive for their ability to apply pedagogical knowledge, they do not seem to develop in a straightforward way. Also, simple scaffolding methods seem not to suffice to foster such a complex skill.

Teacher Educators As Brokers For Research Evidence: Attitudes, Current Practice, and Challenges

Presenting Author:Annika Diery, Technical University of Munich (TUM), Germany; **Co-Author:**Anna Horrer, Technical University of Munich, TUM School of Education, Germany; **Co-Author:**Anne Wiesbeck, TUM School of Education, Germany; **Co-Author:**Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:**Maximilian Knogler, Technical University of Munich (TUM), Germany; **Co-Author:**Maria Bannert, Technical University of Munich (TUM), Germany; **Co-Author:**Tina Seidel, Technische Universität München, Germany

To bridge the gap between research and practice in education, teacher educators might be important brokers. Teacher educators include, explain and discuss recent research evidence on e.g. effective teaching practices or learning environments in their courses. Therefore, teacher educators transfer knowledge generated through research to the practitioners, such as pre-service teachers. In a mixed-methods approach, two studies (online survey and guided interviews) investigate the perspective of teacher educators, to examine their attitudes, current practice, and perceived challenges regarding the use of educational research evidence. In both studies, (online survey: N = 83; interviews: N = 28) teacher educators report to have a positive attitude towards the use of educational research evidence in their own teaching practice. They appraise educational research evidence as personal relevant and useful for their teaching. However, the quantitative and qualitative results show that teacher educators face methodological and practical challenges when it comes to the implementation of evidence in their teaching. These results show that there is still need for further support that leverages the knowledge-transfer from research into practice.

Effects of transactivity in teacher training: Qualitative analyses of collaborative learning

Presenting Author:Lisa Stark, Saarland University, Germany; **Co-Author:**Robin Stark, Saarland University, Germany; **Co-Author:**Kai Wagner, Bildungswissenschaft, Germany; **Co-Author:**Victoria Egele, Saarland University, Germany

From a perspective of bridging the gap between theory and practice, teacher students show deficits concerning knowledge needed to apply pedagogical theories to school situations. However, such knowledge needed to generate evidence-oriented explanations of complex school situations is important to successfully act in the classroom (Meier, 2006). An effective approach to foster such knowledge is collaborative learning from errors in learning environments which integrate problem-oriented and instruction-oriented design-principles. An experimental intervention study was conducted to investigate how to foster individual acquisition of such applicable knowledge in dyadic discourses. Quantitative analyses regarding cognitive outcomes and theory-guided qualitative process-analyses were conducted. As a result, conflict-oriented discourses in dyads seem to foster applicable knowledge to a higher extent than integration-oriented discourses. Qualitative process-analyses of the discourses seem to support this assumption but also indicate processes which could be disadvantageous regarding motivational aspects.

Session T 8

16 August 2019 12:00 - 13:30

Seminar Room - S04

Single Paper

Higher Education, Learning and Instructional Technology

Computer-assisted Learning and Gamification

Keywords: Cognitive skills, Computer-supported collaborative learning, E-learning/ Online learning, Game-based learning, Higher education, Inquiry learning, Knowledge creation, Meta-analysis, Mixed-method research, Reflection, Secondary education, Teaching/instruction, Technology

Interest group: SIG 04 - Higher Education, SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Daniel Dinsmore, University of North Florida, United States

Developing Knowledge Building Using Reflective Assessment and Analytics Tools for Low-Achievers

Keywords: Computer-supported collaborative learning, Inquiry learning, Knowledge creation, Reflection

Presenting Author:Carol Chan, The University of Hong Kong, Hong Kong; **Co-Author:**Yujin Yang, Central China Normal University, China; **Co-Author:**Jan van Aalst, University of Hong Kong, Hong Kong

This study investigates the designs and dynamics for developing knowledge building inquiry and discourse among academically low-achieving students, using reflective assessment supported by analytic tools. Thirty-seven low-achieving students from a ninth-grade visual-arts course in a Hong Kong classroom participated in the study. The design involved developing a principle-based knowledge building pedagogy, with students writing and inquiring collectively on Knowledge Forum® (KF), enriched by reflective assessment and use of an analytic tool called Knowledge Connection Analyzer. Specifically students engaged in collaborative reflection and classroom discourse using the analytic tools to gather data on their KF writing (e.g., Are we collaborating?); and they considered what they have accomplished and how their collective KF inquiry can be improved. Analysis of online KF discourse showed that low-achievers were able to engage in productive KF discourse illustrating metacognitive, collaborative and epistemic inquiry; and KB inquiry was related to conceptual knowledge gains. Qualitative analyses using multiple data sources identified several themes of how the design support productive inquiry including (1) metacognition supported in a social context; (2) reflective talks on their own inquiry; (3) using data from analytics tools to visualize and support ongoing work; and (4) developing reflective practices as collaborative culture and norms. This study has significance addressing issues of equity and access scaffolding collaborative inquiry and knowledge

building for academic low-achievers using analytic-supported reflective assessment.

Epistemic Understanding of Discourse and Knowledge Advance in a Knowledge Building Environment

Keywords: Computer-supported collaborative learning, Knowledge creation, Mixed-method research, Secondary education

Presenting Author:Yuyao Tong, The University of Hong Kong, China; **Co-Author:**Carol Chan, The University of Hong Kong, Hong Kong

This paper examined the role of a computer-supported knowledge building (KB) environment focusing on meta-discourse on students' epistemic understanding of discourse and knowledge advance. Participants were 21 Grade 10 students studying visual art in a Hong Kong secondary school. Students engaged in classroom meta-talk and worked in a multi-media online discussion platform, Knowledge Forum® (KF), to advance community knowledge through collective discourse and sustained idea improvement. The design of KB and KF included students working together (a) inquiring into problems of art; (b) inquiring into the nature of discourse and knowledge-building principles; and (c) writing portfolio where they provided examples and synthesized their knowledge advance. Online and offline discourse were intertwined with students engaging in meta-talk reflection on their KF discussion. Analyses using SNA analytic tool indicated that students' understanding of discourse and principles were increasingly coherent over time, showing more collective growth. Qualitative analyses identified different patterns of understanding of discourse and principles; and there was a significant improvement over time. Students viewed discourse more aligned with the themes of knowledge building. Correlation analysis suggested that students' KF engagement, understanding of discourse, KB principles, and portfolio reflection were correlated. Hierarchical regression analysis indicated that KB principles and understanding of discourse contributed to summary reflection over and above KF engagement. Implications of examining students' understanding of discourse in a knowledge building environment are discussed.

The role of the Need for Cognitive Closure in technology-enhanced learning

Keywords: Cognitive skills, Computer-supported collaborative learning, E-learning/ Online learning, Meta-analysis

Presenting Author:Sven Heimbuch, University of Duisburg-Essen, Germany; **Co-Author:**Daniel Bodemer, University of Duisburg-Essen, Germany

Research suggests that controversies based on opposing points of view and contradictory evidence can be fruitful to trigger individual elaboration processes. However, previous research also showed that many technology-enhanced learning environments are not necessarily suited in their original setup to easily identify relevant content and thus users need further support as guidance. The efficacy in processing controversies and making efficient use of added guidance can be dependent on the individual Need for Cognitive Closure. This motivational construct can be of explanatory value if the focus of interest is on the processing of ambiguity and how persons differ in their personal need for structure. To shed some light on the efficacy of different types of implicit and explicit guidance on learning-related outcomes for high and low levels of Need for Cognitive Closure, we decided to conduct a meta-analysis on published and unpublished studies. Effects on outcome variables like learning success (e.g. test scores) or the quality of knowledge construction artefacts were analysed. Our first results indicate a large heterogeneity in the reviewed sample. The overall effect in favour of added guidance towards control groups is very small, with a minimally more positive effect for persons with a high Need for Cognitive Closure.

Gamification of flipped classroom in higher education

Keywords: Game-based learning, Higher education, Teaching/instruction, Technology

Presenting Author:Michael Sailer, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Maximilian Sailer, University of Passau, Germany

For higher education, the question of how in-class activities can be supported in classroom settings, with more than 100 students present, is of high relevance. There is a research gap concerning studies about gamified flipped classroom interventions, which focus on the gamification of in-class activities and take learning processes into consideration. This study investigates a gamified flipped classroom intervention within an experimental pre-posttest design. $N = 214$ educational science students participated in the study. $n = 109$ students performed a gamified in-class activity, $n = 96$ students performed a non-gamified in-class activity. Based on Landers' (2014) theory of gamified learning we hypothesized an indirect effect of gamification on application oriented knowledge, which is mediated by learning process performance. Results show a significant positive indirect effect of gamification on application oriented knowledge, which is mediated by learning process performance, $b = .10$, $SE = .04$, 95% CI [.02; .19]. The gamified intervention provided students immediate feedback on a task level. This was effective to foster students' performance during the intervention.

Session T 9

16 August 2019 12:00 - 13:30

Seminar Room - S12

Single Paper

Assessment and Evaluation, Higher Education

Assessment Methods and Tools

Keywords: Assessment methods and tools, Computer-assisted learning, Higher education, Instructional design, Multimedia learning, Peer interaction, Professions and applied sciences, Teaching approaches, Teaching/instruction

Interest group: SIG 01 - Assessment and Evaluation, SIG 04 - Higher Education, SIG 17 - Methods in Learning Research

Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark

Designing Computer-Based Tests: Design guidelines from multimedia learning studied with eye tracking

Keywords: Assessment methods and tools, Computer-assisted learning, Instructional design, Multimedia learning

Presenting Author:Kim Dirkx, Open University, Netherlands; **Co-Author:**Claudia Manastirean-Zijlstra, ROC Flevoland, Netherlands; **Co-Author:**Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

Abstract [154 words]. The purpose of this study is to examine whether the guidelines for designing multimedia instruction based on the Cognitive Load Theory (CLT) and Cognitive Theory of Multimedia Learning (CTMML), are also beneficial for computer based testing. In a within-subject experimental design, thirty-three vocational students completed a computer based arithmetic exam, in which half of the items was presented in an original design format and the other half had a layout based on the CTMML principles for instructional design (i.e., adapted format). Visual search and mental effort were measured for both conditions using eye tracking instruments. Mental effort was also measured using thinking aloud as a secondary task. Performance in solving arithmetic problems was compared in both conditions using the testing scores. The results show beneficial effects of the adapted format on visual search, mental effort and, performance measures indicating that applying multimedia principles for learning is also beneficial when designing computer-based testing environments.

Simulation-Based Assessment: The Relationship Between Gaze-Tracking and Exam Performance

Keywords: Assessment methods and tools, Higher education, Professions and applied sciences, Teaching/instruction

Presenting Author:Andreas Gegenfurtner, University of Passau, Germany; **Co-Author:**Adam Szulewski, Queen's University, Canada; **Co-Author:**Rylan Egan, Queen's University, School of Medicine, Dept. of Biomedical and Molecular Science, Canada; **Co-Author:**Daniel Howes, Queen's University, Department of Emergency Medicine / Critical Care, Canada; **Co-Author:**Gerhard Dashi, Queen's University, School of Medicine, Canada; **Co-Author:**Nick McGraw, Queen's University, Canada; **Co-Author:**Andrew Hall, Queen's University, Department of Emergency Medicine, Canada; **Co-Author:**Damon Dagnone, School of Medicine, Dept. of Emergency Medicine, Canada; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands

A key task of the team leader in a medical emergency is effective information gathering. Studying information gathering patterns is readily accomplished with the use of gaze-tracking glasses. This technology was used to generate hypotheses about the relationship between performance scores and expert-hypothesized visual areas of interest in residents across scenarios in simulated medical resuscitation examinations. Emergency medicine residents wore gaze-tracking glasses during two simulation-based examinations ($n = 29$ and 13 respectively). Blinded experts assessed video-recorded performances using a simulation performance assessment tool that has validity evidence in this context. The relationships between gaze patterns and performance scores were analyzed and potential hypotheses generated. Four scenarios were assessed in this study: diabetic ketoacidosis, bradycardia secondary to beta-blocker overdose, ruptured abdominal aortic aneurysm, and metabolic acidosis caused by antifreeze ingestion. Specific gaze patterns were correlated with objective

performance. High performers were more likely to fixate on task-relevant stimuli and appropriately ignore task-irrelevant stimuli compared with lower performers. For example, shorter latency to fixation on the vital signs in a case of diabetic ketoacidosis was positively correlated with performance ($r=0.70$, $p<0.05$). Conversely, total time spent fixating on lab values in a case of ruptured abdominal aortic aneurysm was negatively correlated with performance ($r=-0.50$, $p<0.05$). In summary, the results indicate there are differences between the visual patterns of high and low-performing residents. These findings may allow for better characterization of expertise development in resuscitation medicine and provide a framework for future study of visual behaviours in resuscitation cases.

How can modelling examples be used to promote peer feedback? The role of peer discussion

Keywords: Assessment methods and tools, Higher education, Peer interaction, Teaching approaches

Presenting Author: Floris van Blankenstein, Leiden University Medical Center, Netherlands; **Co-Author:** Paul Steendijk, Leiden University, LUMC Center for Research in Education, Netherlands; **Co-Author:** Nadira Saab, Leiden University, Netherlands

Peer feedback is used in higher education for both practical and pedagogical reasons. By giving peer feedback, students learn how to give constructive comments, communicate clearly, think critically, focus on relevant assessment criteria and collaborate with peers. However, students may not always give constructive feedback without training. A model that demonstrates how to give feedback may help them develop their feedback skills. However, the role of such *modelling examples* in peer feedback training is still ill-understood. Previous research suggests that peer discussion after observing modelling examples is pivotal for the effectiveness of these modelling examples. Therefore, this study aimed at evaluating the impact of peer discussion after observing a modelling example on peer feedback students gave each other after this intervention. 245 third-year medical students were assigned randomly to three conditions: modelling example plus discussion (MED), paper example plus discussion (PED) or modelling example without discussion (ME). Before and after the interventions, they peer reviewed texts written by two fellow-students. The results show that pre-intervention peer feedback was associated consistently with post-intervention peer feedback, suggesting that, irrespective the experimental interventions, students were fairly consistent in the way they gave feedback. In addition, the MED-condition showed positive relations with three types of feedback: positive evaluations, explanations for evaluations and feedback aimed at content of the text. Therefore, only MED seemed to have an impact on students' peer feedback, suggesting that observing modelling examples without discussion, or discussing feedback examples without the feedback being modelled, is ineffective.

Session T 10

16 August 2019 12:00 - 13:30

Seminar Room - S01

Single Paper

Instructional Design, Learning and Special Education

At-Risk Students

Keywords: At-risk students, Competencies, Early childhood education, Language (Foreign and second), Literacy, Primary education, Reading comprehension, Special education, Student learning, Teaching/instruction

Interest group: SIG 06 - Instructional Design, SIG 15 - Special Educational Needs

Chairperson: Reto Luder, Zurich University of Teacher Education, Switzerland

Socioeconomic status, migration background, special education needs and reading competency

Keywords: At-risk students, Competencies, Reading comprehension, Special education

Presenting Author: Jeffrey DeVries, Technical University of Dortmund, Germany; **Co-Author:** Carsten Szardenings, Technische Universität Dortmund, Germany; **Co-Author:** Philipp Doebler, Technische Universität Dortmund, Germany; **Co-Author:** Markus Gebhardt, TU Dortmund, Germany

Migration background, special education needs, and low socioeconomic status have significant negative effects on the longitudinal development of reading competency. We examined their effects on reading competency using longitudinal data from a large-scale longitudinal assessment of German secondary-students (The National Education Panel Study; NEPS). Results indicated that special education needs and both indicators of SES (parental education and relative poverty) were related to worse reading performance. Meanwhile, migration background was negatively related to reading competency grades 5 and 7. However, it was not related in grade 9. Future work is discussed, including expanding analyses to different grade levels as well as other competencies such as spelling and math. Additionally, new research should examine the possibility of an interaction between migration background and special education needs.

Early reading intervention – a promising way to reduce inequity in education?

Keywords: At-risk students, Early childhood education, Literacy, Student learning

Presenting Author: Oddny Judith Solheim, The Norwegian Reading Centre, Norway; **Co-Author:** Jan Frijters, Brock University, Canada; **Co-Author:** Kjersti Lundetræ, Norwegian Reading Centre, University of Stavanger, Norway; **Co-Author:** Per Henning Uppstad, Norwegian Reading Center, Norway

Reading skill is a key determinant for successful inclusion in school and society. Thus, providing all students with high quality literacy instruction is crucial in order to achieve educational equity. However, we still fail to provide education that is fair regardless of personal and social circumstances: reported group differences in reading are consistently related to socio-economic status (SES), ethnic background, and gender. The core problem is that group differences at school entry prevail throughout school years. In the present randomized controlled trial first-grade students ($n=744$) were screened at school entry and children with low pre-reading skills were identified ($n=140$). At-risk students received four weekly 45 minutes intervention sessions in groups of 3-7 students. The intervention combined training in letter knowledge with explicit instruction in phonemic decoding and word recognition, free spelling, connected word reading and shared reading. Students who received the intervention significantly outperformed control students on word reading and sentence reading, and the intervention was found to be particularly effective for boys and students from low SES families. The results from the present study indicate that carefully developed early interventions might be essential in order for boys and students from low SES families to get the most out of their learning opportunities. Results are discussed in relation to content in early reading interventions.

Stimulating language learning through song-based interventions

Keywords: At-risk students, Language (Foreign and second), Primary education, Teaching/instruction

Presenting Author: Vera Busse, University of Koblenz and Landau, Germany; **Co-Author:** Jana Jungclaus, University of Oldenburg, Germany; **Co-Author:** Ingo Roden, Carl von Ossietzky University Oldenburg, Germany; **Co-Author:** Frank Russo, Ryerson University, Canada; **Co-Author:** Gunter Kreutz, University of Oldenburg, Germany

There is growing evidence that singing can have a positive effect on language learning, but few studies have explored its benefit for learning grammar. Our talk focuses on a study with recently migrated children ($N=35$) who received three 40-minute sessions where students learnt the lyrics of two German songs designed to simulate language learning through alternating teaching modalities (singing and speaking). Children improved their language knowledge significantly including on tasks targeting the transfer of grammatical skills, an area largely neglected in previous studies. This improvement was sustainable over the retention interval. However, the two teaching modalities did not show differential effects on cued recall of song lyrics (Busse, et al., in press). The talk outlines implications for future studies and concludes with an outlook on results from a new follow-up study involving EFL learners in primary school ($N=34$) where the singing and the speaking condition was separated. Children in the song condition significantly outperformed children in the spoken condition. All in all, the results suggest that songs may be a valuable supplement for grammar instruction for younger learners. As singing does not require any additional resources and is known to promote well-being (e.g., Hinshaw et al., 2015) and cooperation (e.g., Good & Russo, 2016), results are of high practical value for heterogeneous classrooms.

Session T 11

16 August 2019 12:00 - 13:30
Seminar Room - S02
Single Paper
Teaching and Teacher Education

Teacher Education and Teacher Professional Development

Keywords: Cultural diversity in school, Educational policy, Language (Foreign and second), Primary education, Qualitative methods, Secondary education, Social interaction, Social sciences, Teacher professional development, Teaching approaches, Teaching/instruction

Interest group: SIG 11 - Teaching and Teacher Education, SIG 21 - Learning and Teaching in Culturally Diverse Settings

Chairperson: Christian Sebastián, Pontificia Universidad Católica de Chile, Chile

Teaching financial literacy – investigating teachers' knowledge of context

Keywords: Qualitative methods, Secondary education, Social sciences, Teaching approaches

Presenting Author: Mattias Björklund, Stockholm University, Sweden

Financial literacy is defined by the OECD as a key competence for all, hence introduced in educational systems all around the world (OECD 2005). In Sweden, like in many other countries, teachers, though, have not received any formal financial education but are still compelled to teach. This study contributes to the understanding of how social studies teachers plan and implement financial literacy teaching without having financial content knowledge. The data consists of 21 semi-structured interviews with and submitted lesson planning from Swedish social studies teachers in upper secondary school. By using the construct of PCK (Shulman 1986) and the elaborated sub-construct of knowledge of context experienced and novice teachers' strategies and perceptions regarding financial literacy teaching can be discerned. Results suggest that teachers' lack of financial literacy content knowledge is compensated and substituted by using their knowledge of context. Especially knowledge of students and curricular matters help teachers form financial literacy aims and instruction. Experienced and novice teachers, however, use their knowledge of context in different ways thus presenting a variety of aims depending on how the different groups of teachers perceive syllabus, the diversity among students and future needs of young adults. This study also discusses the complexity between financial literacy ambitions, stipulated in curriculum and syllabus and financial literacy planning and teaching.

Structured Observational Feedback Instrument (SOFI) - An instrument to observe academic feedback

Keywords: Primary education, Social interaction, Teacher professional development, Teaching/instruction

Presenting Author: Vanessa Pieper, University of Vechta, Germany; **Co-Author:** Frederike Bartels, University of Vechta, Germany

A new *Structured Observational Feedback Instrument* (SOFI) which can be used to document academic feedback of teachers and on- and off-task-behavior of pupils in the classroom is described. By means of the instrument, it is possible to detect positive and negative verbal feedback from teachers, based on the frequency with which feedback from a teacher is given in terms of ability, effort, tasks and general. SOFI is a further development of the *Structured Observational Schedule* (SOS) by Burnett and Mandel (2010), which is based on the *Observatory Pupils and Teachers In Classrooms* (OPTIC) by Merrett and Wheldall (1986). The present instrument can be used in a non-specialized manner.

Teachers' Work-Related Stress and Coping Strategies

Keywords: Educational policy, Primary education, Qualitative methods, Teacher professional development

Presenting Author: Anna-Mari Aulén, University of Jyväskylä, Finland; **Co-Author:** Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:** Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

Teaching is regarded as a highly stressful occupation. Although teachers' work-related stressors have been widely studied, only few studies have addressed both stress and coping with it. Consequently, the aim of the current study was to investigate the work-related stressors teachers experience and the strategies they use to cope with the stress. Fifty-two Finnish primary school teachers from a larger follow-up study *Teacher and Student Stress and Interaction in Classroom* (TESSI) answered to the questionnaires. Open-ended questions were analyzed by thematic analysis. Three final themes or rather continuums for the building of stress among teachers were identified: (1) the quality of the supporting factors behind one's work (supportive – challenging); (2) the possibility and value of one's work (–the impossibility and insignificance of one's work); (3) the stability and certainty concerning one's work (–the change and uncertainty concerning one's work). Moreover, three themes concerning the coping strategies teachers used were identified: (1) meaningful free time; (2) interaction; and (3) organizing and setting boundaries for one's work. The results showed that both factors concerning workplace (supporting, enabling and securing teachers' work and offering possibilities for interaction and organization of one's own work) and leisure time (the supportiveness, meaningfulness and sufficient amount of it and the interaction it involves) are crucial for teachers' recovery from stress and their well-being.

Keywords: work-related stress, coping strategies, wellbeing, teacher

Thinking Tomorrow's Teacher Education: Professional Development for Culturally Responsive Teaching

Keywords: Cultural diversity in school, Language (Foreign and second), Teacher professional development, Teaching approaches

Presenting Author: Wai Ming Cheung, The University of Hong Kong, Hong Kong; **Co-Author:** Yanli Huang, The University of Hong Kong, Hong Kong

With the increasing impact of globalization, second language learning has been a prevalent trend. The role of schooling and teachers' support in second language learning is crucial within the context of multiculturalism. There is an urgent need for Hong Kong language teachers to understand and develop strategies so as to better accommodate the needs of these culturally and linguistically diverse (CLD) students. In this study, three groups of teachers who teach Chinese as a second language with CLD students were recruited in this empirical study for three years. A total of 69 teachers who did not receive any professional training for teaching Chinese to the CLD students was the control group. Two professional training modes were developed to enhance and strengthen teachers' professional capacity teaching Chinese to these students. Sixty-five teacher participants from Group 2 attended the teacher professional talks and workshops. Group 3 consisting of 49 teachers who attended both professional development training and conduct learning study in the class with the help of curriculum developers from the university. All of the teacher participants were invited to complete the culturally responsive teaching self-efficacy (CRTSE) questionnaire at the end of the study. Results showed that teachers' CRTSE was the highest in Group 3, who attended both professional development training and conduct learning study in the class with the help of curriculum developers from the university, than participants in Group 2 who only attend professional development training and in control groups. This shed light on tomorrow's teacher education.

Session T 12

16 August 2019 12:00 - 13:30
Seminar Room - S09
Single Paper
Learning and Social Interaction

Touch and Compassion in Educational Interactions

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social aspects of learning and teaching, Video analysis

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Jaakko Hilppö, University of Helsinki, Finland

Compassionate touch in responding to young children's distress in a Japanese preschool

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social aspects of learning and teaching, Video analysis

Presenting Author: Matthew Burdelski, Osaka University, Japan

This paper explores "compassionate touch" in interaction with young children in a Japanese preschool. Previous research shows how children display distress exhibited through crying, yelling, or actions such as rubbing eyes that has arisen from various situations (e.g., falling down, being hit by a peer) (Cekaite & Kvist, 2017). As constitutive of their professional identity and institutional role (Heritage, 2004) to supply children not only with didactic instruction but also with a "morality/ethics of care" (Black, 2019), teachers respond to children's distress by using talk and touch in engaging children in a 'problem-remedy sequence' (Kidwell, 2012) to soothe them and alleviate their distress. Among various kinds of touch (see Cekaite & Kvist, 2017), teachers often deploy compassionate touch to display empathy or concern for the child's well-being, feelings, and desires, using haptic acts such as rubbing, caressing, or picking up.

Student-to-student touch as constructing togetherness in classroom interaction

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social aspects of learning and teaching, Video analysis

Presenting Author: Pilvi Heinonen, University of Helsinki, Finland; **Co-Author:** Liisa Tainio, University of Helsinki, Finland; **Co-Author:** Ulla Karvonen, University of Helsinki, Finland

Classroom climate research has shown that the quality of the learning environment, as it is perceived by students, is associated with their learning outcomes and behavior (e.g. Reyes & al. 2012). In our paper, we investigate students' prosocial activities as they are manifested in interaction between students during lessons. Our focus is on students' tactile interactional practices, more specifically student-to-student-touches that display co-operation and affection, and thus build a sense of togetherness (cf. Cekaite & Holm Kvist 2017). Through detailed analysis of student-to-student touches, we aim to contribute to the understanding of the forms and functions of tactile intercorporeality (e.g. Goodwin 2017), and especially the role of peers in constructing the social environment in the classroom. As a research method, we use multimodal conversation analysis. Our data consist of 129 video recordings of Finnish classroom interaction. In addition, we use teacher interviews as a source of information for teacher perspective and former students' written memories as a source of member's perspective. In the analysis, we identify three touch types: 1) high-five-touch to display celebration during group work, 2) hand-on-shoulder touch to show compassion after teacher-initiated verbal reproach and 3) arm-to-arm touch to display tactile compresence while working side-by-side. Our results show that in classroom interaction it is possible to identify student-to-student touches that display and construct togetherness through celebration, compassion and compresence among the participants. We argue that these tactile interactional practices are important means of accomplishing prosocial activities that, in turn, contribute to the construction of positive classroom climate.

Compassionate touch in adult-child interaction: Soothing responses to children's pain distress

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social aspects of learning and teaching, Video analysis

Presenting Author: Asta Cekaite, Linköping university, Sweden; **Co-Author:** Annukka Pursi, University of Helsinki, Finland; **Co-Author:** Disa Bergnehr, University of Borås, Sweden

Drawing on video-recorded, naturally occurring adult-child-group interactions from Swedish and Finnish early childhood education and care (ECEC) settings, this paper considers the ways in which touch is used by educators and/or by children as a compassionate response to crying. A collection of adult-child soothing sequences occasioned by physical accidents (e.g. a child falls down and begins to cry) were located from a larger data set and analyzed using multimodal interaction analysis method (Goodwin, 2000). Based on an analysis of two different soothing sequences, this paper argues that embodied soothing situations provide rich contexts for a display and socialization into embodied empathy and compassion. The interactional affordances of touch in adult-child interaction are exploited to allow the educator to participate in multiple engagements (actively configure multiactivity situations) in which different institutional tasks - caregiving, teaching and instruction - can fruitfully overlap. Overall, the findings have significant impact for the practice not only by allowing to better understand the role of an adult educator in institutional soothing situations but also to gain a better understanding how soothing of a distressed child can be accomplished within a larger gatherings of adults and children in classrooms. Soothing and compassionate touch can be used to create 1) a private dyadic encounter between an educator and the child; or 2) public multi-party encounter, where compassionate acts are distributed across the peer group. The results contribute to theoretical and educational discussion of a holistic view on children's learning and well-being in institutional early education settings.

Educators' embodied management of children's distress in kindergarten social interaction

Keywords: Conversation/ Discourse analysis, Qualitative methods, Social aspects of learning and teaching, Video analysis

Presenting Author: Antti Rajala, University of Helsinki, Finland; **Co-Author:** Jaakko Hilppö, University of Helsinki, Finland; **Co-Author:** Lasse Lipponen, University of Helsinki, Finland

This study contributes to an emerging field of research around touch in educational interactions. It examines how children's expressed distress is addressed and interactively managed in naturally occurring kindergarten interactions. It poses the following research questions: How are haptic formations (ie., interactional configurations of touch) established, maintained and transformed in the educators' embodied response to children's expressions of distress in kindergarten social interactions? How do the haptic formations contribute to the social relationships performed and produced in the care events? The empirical data comprise video records of social interactions (51h) in a Finnish public kindergarten. We identified all episodes in which a child expressed distress (59 episodes) and analyzed them with embodied interaction analysis. Our findings show that the adults either responded with immediate expression of compassion or strategically postponed the comforting touch depending on the type of care situation and the trigger of distress. We interpret that the postponement of comfort in these situations served pedagogical purposes or other institutional demands. Similar to Cekaite and Kvist Holm (2017), in our data the participants established *face-to-face* and *embracing haptic formations* for a variety of interactional and institutional purposes. We also found two new haptic formations: *we-formation* and *nonreciprocal formation*. Overall, our paper contributes to advance a more nuanced understanding of embodied interactional configurations that shape the opportunities of educators to address the pedagogical and other institutional goals in early childhood education. The study also helps to broaden the theoretical scope of existing research on compassion in education.

Session T 13

16 August 2019 12:00 - 13:30

Seminar Room - S15

Single Paper

Learning and Social Interaction

Learning, Teaching and Instruction

Keywords: Argumentation, Early childhood education, Knowledge creation, Literacy, Motivation, Parental involvement in learning, Quantitative methods, School effectiveness, Self-efficacy, Student learning, Teaching approaches

Interest group: SIG 05 - Learning and Development in Early Childhood, SIG 23 - Educational Evaluation, Accountability and School Improvement, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Robyn Gillies, The University of Queensland, Australia

Learning by Arguing

Keywords: Argumentation, Knowledge creation, Student learning, Teaching approaches

Presenting Author: Kalypto Iordanou, University of Central Lancashire, Cyprus; **Co-Author:** Deanna Kuhn, Teachers College, Columbia University, United States

Can argumentation practice simultaneously promote knowledge acquisition while advancing skill in the practice itself? We examine the effectiveness of a dialog-based argument curriculum in fostering middle-school students' knowledge acquisition as well as dialogic and written argumentation skill with respect to a content-rich, socially significant topic. Results of two studies, one involving a social and the other a physical science topic, showed a single intervention could meet both objectives. Furthermore, this is so even in cases in which pre-existing knowledge regarding the topic is non-existent or negligible. Enough knowledge must be acquired, however, to make argumentation productive or even feasible. A novel brief question-and-answer method was found superior to a traditional one in promoting acquisition of needed factual knowledge.

The Development and Consistency of Cognitive and Non-Cognitive School Effectiveness Criteria

Keywords: Motivation, School effectiveness, Self-efficacy, Student learning

Presenting Author:Luisa Grützmacher, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Johannes Hartig, German Institute for International Educational Research (DIPF), Germany; **Co-Author:**Svenja Vieluf, German Institute for International Educational Research (DIPF), Germany

Many studies on school effectiveness use achievement in a single domain as a relevant effectiveness criterion. However, this practice has been criticized and additional criteria were proposed, among them a positive reading attitude and a positive self-concept in reading. This leads to the essential educational research question about the generalizability of school effects (Bosker & Scheerens, 1989). Therefore, the current study examines the development and the consistency of cognitive and non-cognitive school effectiveness criteria on the basis of the data collected in the Hamburg longitudinal study KESS and processed in the scientific MILES-consortium. The sample is comprised of 9.027 students in 172 secondary schools and 4 measurement occasions. In order to test the hypotheses, two-level growth curve models are estimated and the relationships between the slope factors are assessed (Mplus). The research results showed that the average attitudes towards reading decreases ($M_{RA} = -4.0$), the average reading self-concept ($M_{RS} = 1.6$) and the average reading comprehension increase ($M_{RC} = 10.4$) during secondary schooling. The results also showed that there is significant variance in motivational and achievement development at the school level even after the socio-economic and migrant background has been controlled ($ICC_{slopeRA} = .03$, $ICC_{slopeSC} = .18$, $ICC_{slopeRC} = .12$). However, only the slopes of the reading self-concept and the reading attitudes correlate significantly at the school level ($r = .53$, $p < .00$).

Association of the early Home Literacy Environment (HLE) with children's outcomes

Keywords: Early childhood education, Literacy, Parental involvement in learning, Quantitative methods

Presenting Author:Astrid Wirth, Ludwig-Maximilians-Universität München, Germany; **Co-Author:**Frank Niklas, University of Augsburg, Germany; **Co-Author:**Nadja Drescher, University of Würzburg, Germany; **Co-Author:**Sabrina Guffler, University of Würzburg, Germany; **Co-Author:**Simone Ehmig, Stiftung Lesen, Germany

Home learning environments are closely associated with children's literacy competencies (Sénéchal & LeFevre, 2002). In particular, the Home Literacy Environment (HLE) that focusses on reading habits in families supports language competencies of children (Niklas & Schneider, 2017). The current study investigates the association of different facets of the HLE with early linguistic competencies such as language comprehension, language production, and language memory as well as early literacy competencies such as narrative skills and knowledge and awareness of print. Our sample consisted of $N = 132$ children with an average age of 37 months ($SD = 4.0$) at t1. The global measure of HLE was correlated with quantity and quality of reading as well as parental attitudes towards reading and the onset of reading to a child ($r = .42 - .67$). We found significant correlations between different facets of the HLE and children's outcomes, particularly for language comprehension, language production and narrative skills ($r \leq .58$). Regression analyses were conducted to predict language and literacy competencies by different aspects of the HLE while controlling for various child and family characteristics (e.g. age, gender, intelligence, SES and migration background). We will present and discuss findings of a longitudinal research design.

Session T 14

16 August 2019 12:00 - 13:30

Seminar Room - S14

Single Paper

Teaching and Teacher Education

Teaching and Teacher Professional Development

Keywords: Achievement, Case studies, Communities of practice, Educational Psychology, In-service teacher education, Informal learning, Intelligence, Quantitative methods, Secondary education, Survey Research, Teacher professional development, Video analysis, Vocational education

Interest group: SIG 11 - Teaching and Teacher Education, SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs

Chairperson: Kathryn Bartimote-Aufflick, The University of Sydney, Australia

Principals' supportive leadership for teachers' professional learning communities

Keywords: Quantitative methods, Survey Research, Teacher professional development, Vocational education

Presenting Author:Julia Isabella Warwas, University of Goettingen, Germany; **Co-Author:**Christoph Helm, Johannes Kepler University Linz, Austria; **Co-Author:**Christian Schadt, Georg-August-Universität Göttingen, Germany

Complementing prevalingly descriptive and outcome-oriented research on teachers' Professional Learning Communities (PLC), this paper focuses on conditions within school organizations that promote the communities' work. Of prime interest here is to identify the specific features that characterize supportive leadership and the predictive value of principals' supportive leadership for variations of constitutive PLC elements. To answer these questions, the theoretical part of the paper describes core dimensions of PLCs and potential approaches of support by reviewing available classifications and empirical investigations. Our review reveals that supportive leadership is not restricted to (1) granting structural resources but also includes (2) establishing trustful relationships, (3) contributing ideas and feedback to instructional improvements, and (4) sharing responsibilities. As expected, results from multilevel structural equation models (based on survey data of $N = 395$ teachers from 47 school departments of 34 vocational schools in Germany) document significant associations between perceived leadership behaviours and core dimensions of teacher PLCs. Two of these dimensions, named operational infrastructure (i.e. timely and spatial resources as well as operational routines and project workflows), and normative agreement (i.e. teachers holding a common set of pedagogical values and goals) are particularly closely connected to the availability or absence of principal support. As an outlook, the presentation discusses the needs to provide targeted support according to a specific PLCs developmental stage.

Validating video cases that support PD facilitators in noticing productive teacher learning

Keywords: Case studies, In-service teacher education, Teacher professional development, Video analysis

Presenting Author:Bettina Roesken-Winter, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Sven Schüler, Humboldt-Universität zu Berlin, Germany

Research studies on facilitating PD describe the knowledge and skills facilitators need to effectively attend to teachers' learning processes. The approaches share assigning a central role to mathematics specialized content knowledge (SCK), pedagogical content knowledge on the PD level (PCK-PD) and facilitation moves. Research findings also highlight the role of video-based learning opportunities to qualify facilitators. In this contribution we report on a validation study concerned with designing video cases, taken from a videotaped teacher PD. We explore how eight experienced facilitators perceived the representativeness and the quality of the video cases for using them in facilitator PD. Our results indicate that all video cases present vital opportunities to discuss how to support teacher learning in terms of SCK, PD-PCK and facilitation moves. The participants of our study noticed 114 facilitation moves, which were assigned to the four main categories from a facilitation moves framework. About half of the facilitation moves were categorized to *sustaining an inquiry stance* indicating that the chosen video cases sufficiently show teacher learning in PD. On the basis of our validation study we were able to carefully check the learning opportunities that the chosen video cases can provide for facilitator PD. Our approach can be transferred to other contexts. The procedure of compiling the video cases and validating them takes up the most prominent research findings on facilitator PD. We exemplarily show how the empirical evidence can be used to design facilitator PD.

Teachers' individual and collective innovative behaviour: a review study

Keywords: Communities of practice, In-service teacher education, Informal learning, Teacher professional development

Presenting Author:Stefan Robbers, Open University Netherlands, Netherlands; **Co-Author:**Arnoud T. Evers, Open Universiteit, Netherlands; **Co-Author:**Marjan Vermeulen, Heerlen Open Universiteit, Netherlands

In current society changes come fast and thus, when educating for future generations, more creativity and innovation from the educational system is needed. As teachers are key players in the educational system, innovative behaviour (IB) of teachers seems to be necessary to develop innovations in schools. Previous research in the educational domain focused on the individual perspective of IB, neglecting the group (or collective) perspective. Therefore, based on earlier definitions teachers' IB is defined as the continuous, self-initiated process of idea generation, idea promotion and idea realisation carried out by individuals or groups emergent or deliberately provoked by the context. Keywords based on this definition were used to start an integrative literature review that included publications concerning teachers' individual and collective IB. The total search eventually led to 71 publications that were framed and analysed by using a model that distinguishes between how IB is pursued (individual or collective) and how it unfolds (provoked or emergent). The results show that based on the used definition of IB all the four quadrants were filled, although most studies focussed on the individual quadrants. Furthermore, some definitions were so broadly defined that it was hard to categorize them in one unique quadrant. Based on the results in this study we plead for a broader concept of IB in scientific research. Our next step will be analysing the determinants of IB for and across the four quadrants in the 71 articles we found.

Are high-IQ students more at risk of school failure?

Keywords: Achievement, Educational Psychology, Intelligence, Secondary education

Presenting Author:Ava Guez, Ecole Normale Supérieure, France; **Co-Author:**Hugo Peyre, Robert Debré Hospital, APHP, France; **Co-Author:**Marion Le Cam, Direction de l'Evaluation, de la Prospective et de la Performance (DEPP), Ministère de l'Education Nationale, France; **Co-Author:**Nicolas Gauvrit, Ecole Pratique des Hautes Etudes, France; **Co-Author:**Franck Ramus, Ecole Normale Supérieure, France

While it is well-established that intelligence tests positively predict academic achievement, there remain widespread beliefs that gifted students experience difficulties at school and are particularly at risk of school failure. Many studies have provided evidence to the contrary, however few were based on representative population samples. This paper intended to assess whether prior results on the academic success of gifted children could be generalized to a large sample from the general French population. We analyzed a database of French middle school students (N=30,489), including scores in a fluid intelligence test in grade 6 and a variety of school performance measures in grade 9 (results at a national exam, teachers' grades, academic orientation in high school). In addition, self-efficacy and motivation were assessed. Our results replicate and extend previous findings: high-IQ students scored much better on all academic performance measures, which was corroborated by higher levels of motivation and self-efficacy. Consistently with the previous literature, there was a robust positive relationship between fluid intelligence in grade 6 and academic performance in grade 9 in the whole sample, which was also observed within high-IQ students. Exploratory analyses revealed that the association between high-IQ status and achievement was moderated by social background, such that high-IQ students' performance was less related to social background than their peers'. The positive association between high-IQ and achievement was similar for boys and girls.

Session T 15

16 August 2019 12:00 - 13:30

Seminar Room - S13

Single Paper

Motivational, Social and Affective Processes

Motivation and Educational Psychology

Keywords: Developmental processes, Educational Psychology, Instructional design, Motivation, Motivation and emotion, Quasi-experimental research, Secondary data analysis, Social development, Student learning, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Guillermo Solano-Flores, Stanford University, United States

Does the provision of written grades and report cards reinforce the Big-fish-little-pond effect?

Keywords: Educational Psychology, Motivation, Quasi-experimental research, Secondary data analysis

Presenting Author:Moritz Fleischmann, University of Tübingen, Germany; **Co-Author:**Nicolas Hübner, University of Tübingen, Germany; **Co-Author:**Herb Marsh, Australian Catholic University, Australia; **Co-Author:**Ulrich Trautwein, University of Tübingen, Germany; **Co-Author:**Benjamin Nagengast, Eberhard Karls Universität Tübingen, Germany

The Big-fish-little-pond effect (BFLPE), the negative effect of school- or class-average achievement on academic self-concept after controlling for individual achievement differences, is a seemingly ubiquitous phenomenon. The expectation of receiving school grades as well as their provision are discussed as critical for fostering social comparisons supposed to underlie the BFLPE. Thus, one could assume that the BFLPE will be more negative when written grades are provided ("man-made hypothesis"). On the other hand, decades of research could not identify substantial moderators of the BFLPE. Thus, social comparison processes are seen as imposed natural phenomena that cannot be countered by classroom practices. According to this "total environment hypothesis" students rank order themselves anyway, i.e., independent of formal written grades. In the present study, data from the third cohort of the Swedish ETF-Study was used to test both hypotheses in a setting of a natural experiment. This cohort contains 9,104 students that went to elementary school in the 1970s, a time period in which Swedish municipalities were free to decide if they want to abolish the provision of written grades (about one half of the sample was graded whereas the other half was not). Thus, the dataset provides perfect conditions to test if grading affected the BFLPE. In math, multilevel linear probability models revealed a small negative interaction effect between grading and class achievement. No differences in the BFLPE existed between both groups in spelling, reading and general academic self-concept. These results favor the total environment hypothesis, suggesting universal social comparison processes.

Linking Inter- and Intrapersonal Attribution Theory to Explain Teachers' Response to Student Failure

Keywords: Educational Psychology, Motivation, Motivation and emotion, Teaching/instruction

Presenting Author:Michael Evers, Rheinische Friedrich-Wilhelms-Universität Bonn, Germany; **Co-Author:**Fani Laueremann, University of Bonn, Germany

Research in attribution theory has focused on *interpersonal* (i.e. other-directed) control attributions and responsibility judgments to predict emotional responses and behavioral decisions in the context of negative events, such as student failure (Weiner, 1995). However, evidence suggests that *intrapersonal* (i.e. self-directed) control attributions and responsibility judgments might also play a role in this context and it remains unclear whether inter- and intrapersonal attributions and judgments predict the same outcomes (see reviews in Laueremann & Karabenick, 2011, 2014). Therefore, the present study aimed to combine both perspectives and to examine whether each perspective predicted different emotional and behavioral responses of teachers faced with student failure. For this, a 2-vignette questionnaire that measured other- and self-directed attributions of control, judgments of responsibility, emotional responses (anger, sympathy, guilt) and behavioral intentions commonly examined in attribution research (retributive and utilitarian feedback, intentions to help the student) was given to pre-service (N = 224) and in-service teachers (N = 134). It was found that other-directed attributions and responsibility primarily predicted feedback given to punish the student, whereas self-directed attributions and responsibility primarily predicted self-directed emotions (i.e. guilt) and teachers' intentions to help the student through their own actions. There were no clear distinctions between other- and self-directed attributions and responsibility in their prediction of student-directed emotions (anger, sympathy) and feedback given to help the student improve. This helps explain how teachers arrive at different behavioral decisions and implies that future research should be sensitive to different attributional perspectives predicting different kinds of outcomes.

Analyzing activating instructional arrangements with the Unified Model of Task-specific Motivation

Keywords: Educational Psychology, Instructional design, Motivation, Student learning

Presenting Author:Cornelis de Brabander, Leiden University, Netherlands; **Co-Author:**Folke Glasstra, Leiden University, Netherlands; **Co-Author:**Kim Stroet, Leiden University, Netherlands

In this paper we explored the usability of the Unified Model of Task-specific Motivation (UMTM) in the context of activating teaching-learning arrangements. The UMTM integrates task-specific components from several theories of motivation. Core of the model are four interacting but relatively independent types of valences. Affective and cognitive valences represent expected feelings while doing an activity and thoughts about the value of its consequences respectively;

both affective and cognitive valences can be positive and negative, hence calling for approach and avoidance motivation respectively. The interaction between these four types of valences results in a valence appraisal that influences readiness for action. Task-specific antecedents (facets of autonomy and of feasibility, social relatedness, and subjective norm) influence the valences. In three courses 567 undergraduates provided judgments of all components of the UMTM after a lecture or after a seminar or both. In all courses readiness for action was higher in the seminar than in the lecture. Centrally important in all sessions were perceived external support and sense of relatedness with the teacher. However, each session in each course was characterized by its individual configuration of levels of the components of the model and their relations, whereby the role of facets of autonomy, namely of sense of personal autonomy and perceived freedom of action, stood out. All in all, the Unified Model of Task-specific Motivation can be of great value in the evaluation of teaching-learning arrangements.

Motivational Development of Ability-Grouped Gifted Students: A 9-year Longitudinal Study

Keywords: Developmental processes, Educational Psychology, Motivation, Social development

Presenting Author: Franzis Preckel, University of Trier, Germany; **Co-Author:** Isabelle Schmidt, University of Trier, Germany

While there is evidence for positive effects of ability grouping on gifted students' academic achievement and its development, fewer studies investigated the effects of gifted ability grouping on students' motivational development. When studying the effects of ability grouping, one has to deal with the problem of selection bias because gifted students in settings of ability grouping differ from students in regular classrooms with regard to not only their higher academic ability but also regarding other variables like SES. We present findings from a 9-year longitudinal study on gifted ability grouping for the development of motivational variables including self-concepts, goals, and interests as well as self-esteem with students in gifted classes and regular classes matched by propensity score matching. The development of motivational variables was investigated by conditional latent growth curve modeling using class type as a predictor variable. Primary results for 46 students in special gifted classes and 46 matched students in regular classes from one school showed that class-type had no significant effect on the level or development of most motivational variables under study. For the presentation at the EARLI the data will be extended with that from three further schools.

Session T 16

16 August 2019 12:00 - 13:30

Seminar Room - S03

Single Paper

Cognitive Science, Instructional Design, Learning and Instructional Technology

Experimental Studies in Multimedia Learning

Keywords: Cognitive skills, Comprehension of text and graphics, Content analysis, Experimental studies, History, Instructional design, Learning Technologies, Meta-analysis, Multimedia learning

Interest group: SIG 02 - Comprehension of Text and Graphics, SIG 27 - Online Measures of Learning Processes

Chairperson: Bas Kollöffel, University of Twente, Netherlands

Verbal Cueing: Enhancing Attention on and the Learning of Low-Salient Pictorial Elements

Keywords: Comprehension of text and graphics, Experimental studies, History, Multimedia learning

Presenting Author: Manuel Knoos, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Manuela Glaser, Leibniz-Institut für Wissensmedien, Germany;

Co-Author: Stephan Schwan, Leibniz-Institut für Wissensmedien, Germany

In the context of history education, the adequate use of sources is a key component. In contrast to text sources, image sources are not processed sequentially, but selectively with a focus on central and high-salient pictorial elements. Therefore, learners need support in shifting their attention to the equally meaningful peripheral and low-salient pictorial elements that are otherwise neglected. Multimedia research proposes cueing as a way to guide the attention of learners. This study investigated whether verbal referencing is a beneficial cue to enhance attention on and learning of named pictorial elements compared to unnamed pictorial elements and whether it compensates for the neglect of low-salient pictorial elements. Two historical paintings were presented to the participants (N=24) on a computer screen. Each painting was accompanied by an audio text naming one half of the pictorial elements and leaving the other half unnamed. From the named and unnamed pictorial elements, one half were of low and one half were of high saliency. Eye-movements and learning outcomes were measured. Naming enhanced fixation times on, as well as recall and transfer of named compared to unnamed pictorial elements, both for pictorial elements of low- and high-saliency. The postulated compensating effect could not be demonstrated for fixation times and only partially confirmed for recall and transfer probably due to a priori characteristics of the paintings. Nevertheless, the results support a strong naming effect consistently on all dependent variables and therefore extend research on multimedia cueing, thus being of interest to art and art history museums.

Gaze Replays and Retrospective Protocols to Uncover Cognitive Processes During Multimedia Learning

Keywords: Cognitive skills, Content analysis, Experimental studies, Multimedia learning

Presenting Author: Irene Skuballa, Open University of the Netherlands, Netherlands; **Co-Author:** Simon Büttner, University of Tübingen, Germany

For multimedia learning to be effective learners must actively engage in cognitive processing. In the past, eye tracking technology was used to uncover such processes. Research findings report a strong link between eye movement indices and learning outcomes, however the understanding of the underlying cognitive processes during text-picture integration remains vague. Retrospective think-aloud (RTA) combined with gaze replay is a promising way to bridge this gap (Taylor & Dionne, 2000; van Gog et al., 2005). However, as of yet, it was not investigated what kind of cue should be provided in gaze replays to elicit cognitive multimedia-learning processes in RTAs. The present study compared two kinds of cues, circle versus scanpath, both representing fixations during learning, and a control group without cues to identify the most effective type of gaze replay (N = 73). The results show that visual cueing as compared to a control group yields RTAs higher in quantity and quality: the cues yielded longer RTAs with more utterances on actions, deep learning and metacognition. However, there was no difference between circle and scanpath cues. We conclude that gaze replays with cues visualizing fixations support participants' memory during RTA, but the cue type is negligible.

Prior Knowledge predicts effects of Graphics and Signals when learning with Multiple Representations

Keywords: Comprehension of text and graphics, Experimental studies, Instructional design, Multimedia learning

Presenting Author: Melina Klepsch, Ulm University, Germany; **Co-Author:** Tina Seufert, Ulm University, Germany

The multimedia effect as well as the signalling principle are both known to foster the construction of a mental model of to be learned material. But prior knowledge of learners might be an important factor when it comes to the effectiveness of these two. Therefore, we conducted an experimental study with learning and testing material from the field of computer science with N=135 participants. In a 2x2 factorial design with signalling (without/with) and additional graphical representation (without/with) as the treatment factors we analysed the effects on learning outcomes. Additionally, prior knowledge was included as a moderator. We could find that prior knowledge is an important factor and synergetic effects are only given when prior knowledge is on a sufficient level. This might be due to the special notation of computer code which should be investigated more closely in further studies.

Learning the Specifics of Changes: When Animations are Superior to Static Pictures

Keywords: Comprehension of text and graphics, Learning Technologies, Meta-analysis, Multimedia learning

Presenting Author: Mireille Betrancourt, University of Geneva, Switzerland; **Co-Author:** Sandra Berney, University of Geneva, Switzerland; **Co-Author:** Rolf Ploetzner, Institute of Psychology, Germany

An important potential of animations for learning is their capacity to directly display temporal change. Static pictures, in contrast, can merely indirectly express temporal change. Nevertheless, in two meta-analyses it has been found that the effectiveness of learning from animations – if compared to learning from static pictures – is rather limited: Höffler and Leutner (2007) as well as Berney and Bétrancourt (2016) report only small overall effect sizes in favor of animations. The potentially harmful conclusion that researchers as well as practitioners may draw from these findings is that animations are educationally ineffective. In both

meta-analyses, various moderators have been investigated. So far, however, the specific features of the temporal change have not been considered. Therefore, we investigated to which extend the individual studies on learning from animation vs. learning from static pictures took advantage of the educational potential of animations, namely, that the specific features of the displayed temporal change are relevant to the learning task. In a re-analysis of the Berney and Bétrancourt (2016) meta-analysis we investigated a new moderator at three levels: (1) the features of the displayed change are irrelevant, (2) simple features of the change are relevant, and (3) complex features of the change are relevant to the learning task. While at Level 1 the moderator yields an average effect size close to zero ($g = 0.099$), at Level 2 ($g = 0.273$) and Level 3 ($g = 0.785$) it results in significant small and medium to large average effect sizes.

Session T 17

16 August 2019 12:00 - 13:30

Seminar Room - S05

Single Paper

Cognitive Science, Teaching and Teacher Education

Writing in Primary Education

Keywords: Achievement, Attitudes and beliefs, Cognitive skills, Informal learning, Motivation, Primary education, Quantitative methods, Quasi-experimental research, Teaching/instruction, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Margarida Romero, France

Effects of gender and beliefs on leisure writing activities in children

Keywords: Attitudes and beliefs, Informal learning, Primary education, Writing/Literacy

Presenting Author: Lisa Birnbaum, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; **Co-Author:** Elisabeth M. Schüller, Leibniz Institute for Educational Trajectories (LIfBi) Bamberg, Germany; **Co-Author:** Stephan Kroener, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

Leisure writing can be considered as an inherently valuable cultural activity. How may domain-specific beliefs explain children's leisure writing activities, and what is the interplay of these beliefs with gender? First, in preliminary studies, scales on leisure writing, intrinsic value, and preceding writing-related beliefs were developed. Second, the resulting questionnaire was applied to $N = 963$ German third-graders. In a multiple group structural equation model, we applied the beliefs as predictors of the intrinsic value, which in turn explained a large proportion of variance in children's leisure writing activities. There were higher mean values in all scales for girls than for boys. Gender differences in leisure writing as a criterion were completely explained by the gender differences in the intrinsic value. Significance of beliefs and gender as determinants of leisure writing are discussed.

Correlates of handwriting automaticity at school entry

Keywords: Cognitive skills, Primary education, Quantitative methods, Writing/Literacy

Presenting Author: Camilla Lausund Fitjar, University of Stavanger, Norway; **Co-Author:** Guido Nottbusch, University of Potsdam, Germany; **Co-Author:** Mark Torrance, Nottingham Trent University, United Kingdom; **Co-Author:** Vibeke Rønneberg, University of Stavanger, Norway

How do graphomotor skills and emergent literacy skills correlate with children's handwriting at school entry? Both are likely to contribute to letter-writing, however, their relative contribution to children's handwriting at school entry is unclear. This paper investigates the correlation between emergent literacy skills, graphomotor skills and handwriting fluency at school entry in a Norwegian context. Handwriting research tend to focus on at-risk students or children already in school, and the effect of interventions rather than skills at school entry. This study is an attempt to fill this gap in literature with a sample of 186 students within four weeks of school entry, and provide detailed fluency measures by collecting process data with a digitizing board. To measure fluency in children's handwriting we gathered process data from two tasks, one near-point copy task (known and unknown letters), and one letter-sound dictation task. This allows us to distinguish between non-letter graphomotor skills and letter writing skills. The non-letter graphomotor tasks measure how fluently the child uses the pencil. The tasks represent movements common in letter writing. To measure emergent literacy skills tasks included letter identification, first sound identification in a word, spelling, reading, phoneme segmentation, and letter naming. First we hypothesize that the fluency of letter production will be predicted by letter sound knowledge and letter recognition. Second, we hypothesize that children with good emergent literacy skills will copy known letters more fluently than unknown letters because they benefit from letter knowledge in the production.

Writing texts because you 'want' or because you 'must'? A self-determination theory perspective

Keywords: Motivation, Primary education, Quasi-experimental research, Writing/Literacy

Presenting Author: Fien De Smedt, Ghent University, Belgium; **Co-Author:** Steve Graham, Arizona State University, United States; **Co-Author:** Hilde Van Keer, Ghent University, Belgium

We investigated the impact of explicit writing instruction and peer-assisted writing on elementary students' writing motivation during a two-iteration intervention study. In the first iteration 11 teachers and their 206 fifth and sixth-grade students participated in a 2 (i.e.; explicit instruction versus writing opportunities without explicit instruction) \times 2 (i.e.; peer-assisted writing versus writing individually) experimental intervention study with a pretest-posttest design. The four experimental conditions were compared with a business as usual (BAU) condition. In the larger-scale follow-up iteration, participating classes ($N=431$ fifth and sixth graders, $N=20$ teachers) were randomly assigned to either one of both experimental conditions (i.e., EI+PA students received explicit instruction and practiced writing with a peer, while EI+IND practiced writing individually) or a BAU condition. A randomized control design with two measurement occasions was used and multilevel analyses were performed. In the first iteration, multilevel results showed that students who wrote with a peer were more autonomously motivated at posttest than BAU students. Additionally, BAU students and students receiving explicit instruction were more controlled motivated than students who were offered ample writing opportunities while practicing individually. In the second iteration, EI+PA students were less controlled motivated to write compared to their EI+IND counterparts. Based on these findings, theoretical and educational implications will be discussed in view of stimulating students' motivation during everyday classroom writing.

Writing and reading in Year 1: The role of handwriting automaticity and writing instruction

Keywords: Achievement, Primary education, Teaching/instruction, Writing/Literacy

Presenting Author: Deborah Pino-Pasternak, University of Canberra, Australia; **Co-Author:** Anabela Malpique, Murdoch University, Australia, Australia

Theories of writing development and accumulating evidence indicate that handwriting automaticity is related to the development of effective writing skills, and that writing and reading skills are also associated with each other. However, less is known about the nature of these associations and the role of instructional factors in the early years. The present study examines: (1) the influence of handwriting automaticity in the writing and reading performance of Year 1 students, both concurrently and longitudinally; (2) associations between students' writing and reading performance and writing instruction. The current study involved 154 Year 1 children ($Mage = 6.48$, $SD = 3.65$ months; 52% female) enrolled in 24 classrooms from seven government-funded primary schools in Western Australia. Individual child-level data (i.e., handwriting automaticity, word-reading, writing quality and production) were collected and teachers were asked to complete a survey assessing the amount and type of writing instruction (i.e., *teaching basic skills and teaching writing processes*) and *amount of writing practice in their classrooms*. Data analyses included multilevel modelling. Handwriting automaticity predicted both writing quality and writing production concurrently and longitudinally after accounting for gender and initial word reading skills. In addition, handwriting automaticity predicted reading performance longitudinally. Writing and reading performance were related to the amount of writing practice, while only teaching planning and revising were positively associated with writing performance. Implications for writing development and writing instruction are discussed.

Session T 18

16 August 2019 12:00 - 13:30

Seminar Room - S07

Single Paper

Assessment and Evaluation, Learning and Instructional Technology

Educational Technology and Technology-Enhanced Learning and Instruction

Keywords: Artificial intelligence, Assessment methods and tools, Collaborative Learning, Computer-assisted learning, Computer-supported collaborative learning, Educational technology, Game-based learning, Instructional design, Learning analytics, Learning Technologies, Mixed-method research, Motivation, Secondary education, Technology

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Hilda Borko, Stanford University, United States

Structural Gamification for Adaptation based on Learning Analytics

Keywords: Game-based learning, Learning analytics, Learning Technologies, Motivation

Presenting Author:Elise Lavoué, Jean Moulin Lyon 3 University, France; **Co-Author:**Stuart Hallifax, University Jean Moulin Lyon 3, France; **Co-Author:**Jean-Charles Marty, LIRIS, France; **Co-Author:**Audrey Serna, INSA de Lyon, France

Gamification is widely used to increase learner motivation when using a learning environment. Recent research has shown that gamification should be adapted to learner profile, as learners do not respond at the same manner to game elements, and in some cases, learners can feel demotivated by certain game elements. We propose a structured approach for gamification, named structural gamification that allows adapting game elements without changing the educational content or altering the functioning of the learning environment. This approach relies on three levels of abstraction: motivational strategies (high-level tactics or techniques to encourage learners to participate in the learning process), game elements (specific implementations of motivational strategies), and game element instances (contextualized instantiations of game elements). Using this approach, adaptation can occur on any of the three levels, either by changing motivational strategy, or game element or by modifying the game element instance directly. This allows for a more fine-grained adaptation that is based on three components: the learner profile, interaction traces with the learning environment, and contextual information. Our future work will be focused on the analysis of learner engagement during the learning activity through their interaction traces to allow for dynamic adaptive gamification.

Vicarious learning with agent-based models: When is it effective?

Keywords: Computer-assisted learning, Computer-supported collaborative learning, Educational technology, Instructional design

Presenting Author:Ilana Dubovi, Ben-Gurion University of the Negev, Israel; **Co-Author:**Victor Lee, Utah State University, United States

Science content knowledge is essential for many applied practices within health-care professions. Therefore, the current study seeks to promote in-depth conceptual understanding of science content about antidiabetic pharmacology among health-care professionals using agent-based model simulations. Literature shows that learning with agent-based models promotes conceptual learning. However, to achieve these potential benefits, scaffolding and guidance are needed. Current research on instructional guidance for learning with agent-based models evaluates the balance between type of guidance, learner characteristics, and desired learning outcomes within science instruction among health-care professions. This study employed a quasi-experimental pre-and post-test design. Students from nutrition, health education and nursing programs were randomly assigned to one of the experimental groups: one group learned with agent-based models using the vicarious learning approach where pairs viewed and discussed recordings of others using agent-based models, while the other group explored agent-based models with discussing a set of text-based prompts. Both formats were designed to be active learning based on the ICAP framework (Chi & Wylie, 2014), with both encouraging peer dialogue and active knowledge construction activities. The results suggest that the vicarious learning yielded outcomes superior to agent-based models exploration. More detailed evaluation shows that nursing students' performance wasn't affected by the type of guidance, while less experienced in pharmacology content, non-nursing students, benefited more from vicarious specific guidance. These findings suggest that scaffolding for learning from agent-based models should take different forms based on learners' prior knowledge.

Uniting Two Dissimilar Siblings: Introducing Fuzziness to PISA's Machine-Supported Coding System

Keywords: Artificial intelligence, Assessment methods and tools, Educational technology, Technology

Presenting Author:Fabian Zehner, DIPF | Leibniz Institute for Research and Information in Education, Germany; **Co-Author:**Frank Goldhammer, DIPF | Leibniz Institute for Research and Information in Education, Centre for International Student Assessment (ZIB), Germany; **Co-Author:**Kentarō Yamamoto, Educational Testing Service, United States

In this study, we make first steps to combine two recently developed approaches for automatically scoring short text responses in the *Programme for International Student Assessment* (PISA). While PISA's Machine-Supported Coding System (MSCS) identifies a response's code very accurately, it is only applicable to a very limited range of new responses. The second system (ReCo) is somewhat less accurate, but its coding is not limited to a given range of responses. In this study, we transform MSCS's approach step-by-step towards ReCo's methodology, attempting to retain as much accuracy as possible while gaining a larger coverage of codable responses. Furthermore, the study adopts MSCS's overarching goal of being generalizable to all test languages used in PISA (more than a hundred). Using PISA 2012, 2015, and 2018 data, the presentation will investigate the impact on accuracy and the gain in manual coding effort reduction. Preliminary analyses of the 2012 data and selected preprocessing steps show promising results. Basic preprocessing steps attain additional 5.7% in effort reduction compared to MSCS while losing only 0.3% in accuracy. Further steps yield a substantial total effort reduction for manual coding of 12.6%, but entail a loss of accuracy of 2.3%. The system is planned to be tested in future operational work in PISA for improving data quality and for informing the routing of the adaptive test approach.

Metacognitive scaffolds in collaborative video annotation and analytics for deep and social learning

Keywords: Collaborative Learning, Educational technology, Mixed-method research, Secondary education

Presenting Author:Elizabeth Koh, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**Jennifer Pei-Ling Tan, National Institute of Education/Nanyang Technological University, Singapore, Singapore; **Co-Author:**Christin Jonathan, National Institute of Education/Nanyang Technological University, Singapore, Singapore

Deep and socially-oriented learning processes and outcomes require purposefully designed pedagogical conditions and metacognitive scaffolds. However, there is a scarcity of metacognitive supports for reflection and goal-setting in learning analytics (LA) dashboards. This paper presents a collaborative video annotation and formative LA pedagogical innovation designed with metacognitive scaffolds to foster secondary students' deep and social learning dispositions. Repeated measures ANOVA revealed significant improvements in the intervention group students' (n=36) deep and social learning dispositions as compared to their control group peers (n=35). Qualitative students' and teachers' accounts provide a more nuanced understanding of how their learning experiences with the pedagogical innovation might have fostered shifts towards deep learning and social learning goal orientations. The findings are discussed to make sense of the potentials and challenges of designing and using LA dashboards and collaborative learning environments with appropriate metacognitive scaffolds to foster students' deeper and socially-oriented learning interactions and outcomes in mainstream schooling.

Session T 19

16 August 2019 12:00 - 13:30

Lecture Hall - H08

Single Paper

Higher Education

Teaching and Instruction in Higher Education

Keywords: Achievement, Attitudes and beliefs, Higher education, Integrated learning, Interdisciplinary, Meta-analysis, Teaching approaches, Teaching/instruction

Interest group: SIG 04 - Higher Education

Chairperson: Roger Säljö, University of Gothenburg, Sweden

University-Business Cooperation and Work-Related Learning in Higher Education:students' perspectives

Keywords: Higher education, Integrated learning, Teaching approaches, Teaching/instruction

Presenting Author:Daniela Frison, University of Florence, Italy; **Co-Author:**Concetta Tino, University of Padua, Italy; **Co-Author:**Monica Fedeli, University of Padova, Italy

The study is placed within the framework of University-Business Cooperation and the enhancement of Work-Related Teaching and Learning Methods with the aim to explore teachers' and students' perspectives about WR activities/programs and identify key-elements for supporting and improving WR methods design and implementation in Higher Education. A two phases research design has been chosen as suitable methodology for an in-depth understanding of the issue. During the first phase, a multiple case studies research design was followed to collect teachers' perspectives, involving teachers from 3 Italian Universities (Padua, Siena, and Florence) and referring to a range of academic disciplines (Education, Chemical and Industrial Engineering, Mathematics, Psychology, Sociology). During the second phase - in progress – 3 focus groups will be led with students who took part in the selected WR activities/programs.

Learning to Teach in Higher Education: Supporting Transfer through Authentic Activities?

Keywords: Attitudes and beliefs, Higher education, Interdisciplinary, Teaching/instruction

Presenting Author:Barbara Beege, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Julia Murböck, Ludwig-Maximilians-Universität (LMU), Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

The purpose of this study is to examine how to support participants' transfer of learning within the context of higher education trainings. This study has been constructed based on the activity theory of transfer of learning (Greeno & Nokes-Malach, 2016), claiming that learners need to be involved in authentic activities. Due to the theory of planned behavior (Ajzen 2012) the intention of transfer of learning, can be seen as a key indicator of actual transfer of learning. Based on both theories the study investigate to what extent an authentic activity oriented training has an effect on the intention of transfer of learning and the actual subjective transfer of learning. In the present study, 42 lecturers took part in trainings on teaching methods. They were assigned either to a traditional training or to an authentic activity training condition. The intention of transfer of learning, the actual subjective transfer of learning and constraints of participants were measured via rating scales. Results show, that the participants of the two training conditions showed no significant differences in intention of transfer of learning and actual subjective transfer of learning. Thus, the authentic activity training condition did not facilitate transfer of learning. The reason might be, that the situation was not authentic enough to reduce participants' constraints. However, the theory of planned behavior provides a frame to predict intention of transfer of learning based on the constraints. In future there will be a new iterative circle to optimize the training regarding the constraints of the lecturers.

What's the Use of Lectures? A Meta-Analysis

Keywords: Achievement, Higher education, Meta-analysis, Teaching/instruction

Presenting Author:Maja Flaig, University of Trier, Germany; **Co-Author:**Tobias Heltemes, University of Trier, Germany; **Co-Author:**Michael Schneider, University of Trier, Germany

Lectures are widely used for teaching at different educational levels, yet their effectiveness for the acquisition of complex declarative knowledge, procedural knowledge, and non-cognitive learning outcomes (social competence, motivation, attitudes, personality) has been called into question. This meta-analysis evaluated the effectiveness of lectures compared to other instructional methods on various learning outcomes from 65 articles reporting 405 effect sizes. Our moderator analyses are not in line with the findings of previous qualitative reviews, that lectures are not as effective for promoting complex declarative knowledge and procedural knowledge as other instructional methods. Only non-cognitive learning outcomes, such as social competence, motivation, attitudes, personality, were less effectively learned from lectures than from non-lecture classes. We conclude from our meta-analysis that lectures can be effective for a wide range of learning outcomes. Thus, the results of the current meta-analysis can inform practice and provide guidance for planning effective instruction.

Session T 20

16 August 2019 12:00 - 13:30

Seminar Room - S06

Symposium

Culture, Morality, Religion and Education

Religious and Secular Plurality and RE Classroom interaction in Finland, Germany and Sweden

Keywords: Case studies, Cultural diversity in school, Multicultural education, Peer interaction, Religious studies, Social aspects of learning and teaching, Social interaction, Teaching/instruction, Video analysis

Interest group: SIG 19 - Religions and Worldviews in Education

Chairperson: Martin Ubani, University of Eastern Finland, Finland

Discussant: Konstantin Lindner, University of Bamberg, Germany

The aim of this symposium is to discuss with fresh empirical results how religious education classrooms in Europe deal with the plurality of religious and secular world views in modern Western societies. The guiding research question of the symposium is: How do the plurality of religious and secular worldviews challenge the present conceptions of religious education in Europe? Recently there has been a growing international interest in classroom research in RE. Much of the interest is connected to the societal changes with regards to secularization, plurality and diversities. This symposium highlights the forefront of international classroom research today in religious education. The symposium is based on four case studies from Finnish, German and Swedish classrooms. The symposium will produce empirical grounds for conceptualising comparative research on RE and research-based educational environments with plural secular and religious positions among students.

The participants of the symposium are:Chair: Martin Ubani, University of Eastern Finland, FinlandPresenter 1: Martin Ubani, University of Eastern Finland, FinlandIs it a question of religion at all? Finnish students experiences of integrated RE classrooms.Presenter 2: Ulrich Riegel & Sarah Delling, University of Siegen, GermanyAddressing religion and secularity in German Catholic education. An exploratory thematic analysis on videotaped Religious Education in state schoolsPresenter 3: Christina Osbeck, University of Gothenburg, SwedenRE classroom research and hidden curricula revelations – Examples from SwedenPresentation 4: Karin Kittelmann Flensner, University West, SwedenDivergent opinions and controversial issues in the Religious Education classroom practiceDiscussant: Ina Ter Avest, INHolland University of Applied Sciences, Netherlands

Is it a question of religion at all? Finnish students experiences of integrated RE classrooms.

Presenting Author:Martin Ubani, University of Eastern Finland, Finland

In this presentation I will discuss results on a recent small-scale teaching experiment where students from Lutheran, Orthodox and secular humanist backgrounds (N=24) studied together for 5 lessons in religious education. The study included both quantitative data and qualitative interviews. The study indicated that the students did not find it problematic to study together. It seems that the students do not approach the integrated RE lessons primarily as a question of religion or "religious" but rather as an ordinary learning situation where aspects important to classroom learning in general are integral: among other things the previous grade in RE or in Secular Ethics was more clearly connected with the experiences of the instruction than religiosity.

Addressing Religion and Secularity in German Catholic Education. An Analysis on Videotaped Lessons

Presenting Author:Ulrich Riegel, University of Siegen, Germany; **Co-Author:**Sarah Delling, University Siegen, Germany

Previous studies question whether students in German religious education have the chance to deal with the plurality of worldviews in both realms: the religious and the secular. This paper addresses this question by analysing videotaped 116 Catholic religious education lessons. The qualitative analysis of the data showed that the core of German religious education is on religious issues However, the analysis also indicates that even in denominational religious education it

is possible to address the full range of worldview in modern society but that much of current religious education does not meet this openness. This raises the need to do further studies on the topic.

RE classroom research and hidden curricula in Sweden

Presenting Author:Christina Osbeck, University of Gothenburg, Sweden

One reason why classroom research is important is that it reveals that expectations and intentions are not always fulfilled and that hidden curricula tend to work alongside the official ones. The overarching research question of this presentation concerns what kind of hidden curricula and potential learning concerning religion and religious individuals that one may identify in Swedish RE classrooms in secondary schools. The intentions with the Swedish RE subject is presented and a sociocultural perspective on learning that stresses learning as participation in discursive practices is stressed for understanding how a "hidden" curriculum may become hegemonic. The empirical material drawn on are classroom observations and interviews, and the analyses focus on speech genres and their implications for the potential learning. The findings show e.g. how both students and teacher come to construct religion as a phenomenon to mock and religious people as deviating. Finally a possible pedagogical implication of the study is discussed where the potential importance of introducing meta-reflection in the teaching of RE, about the power of hegemonic speech genres, is stressed.

Divergent opinions and controversial issues in the Religious Education classroom practice

Presenting Author:Karin K Flensner, University West, Sweden

The overall purpose of this paper is to investigate how teachers in different Religious Education classroom handle diversity of views, especially in matters that can be described as "controversial". This study has an ethnographic approach and is based on participatory observations of 24 Religious Education lessons in seven upper secondary schools. Individual interviews with four teachers and seven focus group interviews with 27 students were also conducted. The preliminary results indicate that many teachers avoid teaching in areas where they believed that there were strong views and a multitude of opinions. The results raise questions about how to handle issues about pluralism in opinions and different aspects of diversity in the classroom practice. This is an integral question in order to fulfil the curricular demands presented to one of the main democratic institutions of a pluralistic and multi-religious society: the school.

Keynotes - PART 3 1

16 August 2019 13:45 - 15:15

Lecture Hall - H02 - Trivago Hörsaal

EARLI Keynote Session

Motivational, Social and Affective Processes

Motivation and Self-Regulated Learning: Introducing Strategy Motivation and Information Regulation

Keywords: Educational Psychology, Learning analytics, Motivation, Self-regulation

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Marold Wosnitza, RWTH Aachen University, Germany

Research continues to expand our understanding of the essential role of self-regulated learning (SRL) and motivation in the learning process. In this talk, I begin by presenting examples of relations between strategy use and *outcome-focused motivation*, which is motivation that derives from the goals students are attempting to accomplish. I will then present research on *strategy-focused motivation* and describe how the motivational characteristics of strategies themselves, specifically students' perceptions of the benefits and costs of using strategies, can account for additional variance in strategy use. Finally, I will introduce and present evidence concerning the concept of *Information Regulation (IR)*. This refers to ways that learners regulate whether and how they utilize learning-related information accessible to them on learning management systems and student-facing course dashboards. Examples are whether and how often they opt to access their performance level compared to peers, or want to know which course resources their peers have accessed. Students' appraised benefits and costs of regulating information will be compared with their use of other forms of SRL.

Motivation and Self-Regulated Learning: Introducing Strategy Motivation and Information Regulation

Presenting Author:Stuart Karabenick, University of Michigan, United States

Research continues to expand our understanding of the essential role of self-regulated learning (SRL) and motivation in the learning process. In this talk, I begin by presenting examples of relations between strategy use and *outcome-focused motivation*, which is motivation that derives from the goals students are attempting to accomplish. I will then present research on *strategy-focused motivation* and describe how the motivational characteristics of strategies themselves, specifically students' perceptions of the benefits and costs of using strategies, can account for additional variance in strategy use. Finally, I will introduce and present evidence concerning the concept of *Information Regulation (IR)*. This refers to ways that learners regulate whether and how they utilize learning-related information accessible to them on learning management systems and student-facing course dashboards. Examples are whether and how often they opt to access their performance level compared to peers, or want to know which course resources their peers have accessed. Students' appraised benefits and costs of regulating information will be compared with their use of other forms of SRL.

Keynotes - PART 3 2

16 August 2019 13:45 - 15:15

Lecture Hall - H01

EARLI Keynote Session

Assessment and Evaluation

Products, Processes, Psychology, & Technology: Quo Vadis Educational Assessment?

Keywords: Assessment methods and tools, Educational Psychology, Psychometrics, Technology

Interest group: SIG 01 - Assessment and Evaluation

Chairperson: Patricia A. Alexander, University of Maryland, United States

Educational assessment began in the 20th century with the development of highly reliable statistical methods for scoring tests. Amazing refinements have been produced in statistical models, marking methods, administration, etc. With the development of personal computing, tests are now delivered on-screen with adjustments for student performance and an ever-increasing verisimilitude of real-world processes. We now have a vast array of statistical methods to model student responses for almost any test-like product. However, this success has been achieved by neglecting complicating factors such as schooling processes and intra- and inter-personal factors involved in learning and instruction. Assessment 'for' learning has drawn attention to the interactive classroom processes of question and answer, feedback, micro-adjustment to instruction, and the involvement of students in assessment. Unfortunately, these dynamic processes are extremely difficult to model mathematically because they are so context dependent. Thus, they remain largely outside the abilities of psychometric statistics. Further, there is strong resistance in many quarters to reducing the complexity of classroom action to something that could be expressed as a statistical model. Thus, we know that assessment is much more than a product, but we have little grasp of how to capture these complexities in methods suited to the evaluation of assessment products. For a long time, the domains of educational, social, and cultural psychologies related to learning and instruction have been neglected in assessment. We are now on the cusp of significant and substantial development in educational assessment as greater emphasis on the psychology of assessment is brought into the world of testing both products and processes. Herein lies the future for our field: integration of psychological theory and research with statistics and technology to understand processes that work for learning, identify how well students have learned, and what further teaching and learning is needed.

Products, Processes, Psychology, & Technology: Quo Vadis Educational Assessment?

Presenting Author:Gavin Brown, University of Auckland, New Zealand

Educational assessment began in the 20th century with the development of highly reliable statistical methods for scoring tests. Amazing refinements have been produced in statistical models, marking methods, administration, etc. With the development of personal computing, tests are now delivered on-screen with adjustments for student performance and an ever-increasing verisimilitude of real-world processes. We now have a vast array of statistical methods to model student responses for almost any test-like product. However, this success has been achieved by neglecting complicating factors such as schooling processes and intra- and inter-personal factors involved in learning and instruction. Assessment 'for' learning has drawn attention to the interactive classroom processes of question and answer, feedback, micro-adjustment to instruction, and the involvement of students in assessment. Unfortunately, these dynamic processes are extremely difficult to model mathematically because they are so context dependent. Thus, they remain largely outside the abilities of psychometric statistics. Further, there is strong resistance in many quarters to reducing the complexity of classroom action to something that could be expressed as a statistical model. Thus, we know that assessment is much more than a product, but we have little grasp of how to capture these complexities in methods suited to the evaluation of assessment products. For a long time, the domains of educational, social, and cultural psychologies related to learning and instruction have been neglected in assessment. We are now on the cusp of significant and substantial development in educational assessment as greater emphasis on the psychology of assessment is brought into the world of testing both products and processes. Herein lies the future for our field: integration of psychological theory and research with statistics and technology to understand processes that work for learning, identify how well students have learned, and what further teaching and learning is needed.

Keynotes - PART 3 3

16 August 2019 13:45 - 15:15
Lecture Hall - H03 - Otto Fuchs Hörsaal
EARLI Keynote Session
Learning and Social Interaction

The Role of Writing in Education

Keywords: Mixed-method research, Primary education, Student learning, Writing/Literacy

Interest group: SIG 12 - Writing

Chairperson: Debra Myhill, University of Exeter, United Kingdom

Writing plays an important part in schools today – in all subjects and at all levels. Researchers and teachers however points to unexploited potential among students when it comes to this proficiency. The aim of this presentation is to reflect on the function and potential of writing and to discuss what it takes to develop competent student writers – and professional writing teachers – for the present and the future. The presentation will draw on findings and experiences from a large mixed method project on writing and assessment in primary school (*Developing national standards for the assessment of writing. A tool for teaching and learning*, <http://norm.skrivesenteret.no/>). This study was designed as a dialogical intervention, running for a period of two years and focusing on writing in different subjects. It included students (3rd – 7th grade) and their teachers from 24 schools. The intervention was based on a functional construct of writing and explicit norms of expectations and aimed at discovering possible effects of a writing education guided by these resources. Main findings from the study were all together a considerably improved writing proficiency among the students, especially articulated among the youngest ones (3rd and 4th grades). The study also showed enhanced consciousness and competence among the teachers on how to plan and assess writing. However, it uncovered great variety between schools and within schools. Experiences from this study will be used as basis for discussing learning and developmental potential in student writing – and for discussing premises for successful writing education. Challenges like school culture, teachers' literacy competence, and the accelerating focus on measuring achievements will be highlighted. The possibilities in building professional communities among teachers in writing and assessment will also be thematized – together with a discussion on methodological challenges in carrying out intervention studies in dynamic school ecologies.

The Role of Writing in Education

Presenting Author:Synnøve Matre, Norwegian University of Science and Technology, Norway

Writing plays an important part in schools today – in all subjects and at all levels. Researchers and teachers however points to unexploited potential among students when it comes to this proficiency. The aim of this presentation is to reflect on the function and potential of writing and to discuss what it takes to develop competent student writers – and professional writing teachers – for the present and the future. The presentation will draw on findings and experiences from a large mixed method project on writing and assessment in primary school (*Developing national standards for the assessment of writing. A tool for teaching and learning*, <http://norm.skrivesenteret.no/>). This study was designed as a dialogical intervention, running for a period of two years and focusing on writing in different subjects. It included students (3rd – 7th grade) and their teachers from 24 schools. The intervention was based on a functional construct of writing and explicit norms of expectations and aimed at discovering possible effects of a writing education guided by these resources. Main findings from the study were all together a considerably improved writing proficiency among the students, especially articulated among the youngest ones (3rd and 4th grades). The study also showed enhanced consciousness and competence among the teachers on how to plan and assess writing. However, it uncovered great variety between schools and within schools. Experiences from this study will be used as basis for discussing learning and developmental potential in student writing – and for discussing premises for successful writing education. Challenges like school culture, teachers' literacy competence, and the accelerating focus on measuring achievements will be highlighted. The possibilities in building professional communities among teachers in writing and assessment will also be thematized – together with a discussion on methodological challenges in carrying out intervention studies in dynamic school ecologies.

Session U 1

16 August 2019 15:30 - 17:00
Lecture Hall - H10
SIG Invited Symposium
Instructional Design

SIG 6: Non-cognitive effects of instructional interventions in applied domains.

Keywords: Comprehension of text and graphics, Experimental studies, Instructional design, Lifelong learning, Meta-analysis, Motivation, Motivation and emotion, Quantitative methods, Quasi-experimental research, Self-efficacy, Teaching approaches, Teaching/instruction

Interest group: SIG 06 - Instructional Design

Chairperson: Martin Merkt, Germany

Organiser: Martin Merkt, Germany

Organiser: Jean-Michel Boucheix, University of Dijon, LEAD-CNRS, France

Discussant: Erno Lehtinen, University of Turku, Finland

In the context of life-long learning, non-cognitive outcomes of instructional interventions are pivotal because learners' motivation and self-efficacy may determine whether learners seek further learning opportunities or actually transfer the acquired knowledge to the workplace. Therefore, this SIG-invited symposium gathers four contributions addressing non-cognitive outcomes of instructional interventions regarding skills that are highly relevant for successful performance in the respective workplaces. In the first contribution, Großer et al. compare the effects of an innovative online lecture format to a classical lecture about a surgical procedure with regard to learners' appraisal of the lecture and knowledge acquisition. In the second contribution, Pankov and Betrancourt investigate the cognitive and non-cognitive effects of dynamic and static learning materials about how to perform a specific task on the computer. In the third contribution, Vermeiren et al. address how a four-day simulation of political decision-making affects learners' self-efficacy with regard to their negotiation skills. Finally, Wijnia

et al. report the results of a meta-analysis about the effects of different learner-centered interventions on students' motivation. By gathering research that addresses non-cognitive aspects of instructional interventions in applied learning domains, this symposium hopes to inspire dialogue between researchers about different methodologies to investigate similar research questions that are of high practical relevance. In his discussion, Erno Lehtinen will wrap-up the symposium. Note that this symposium is linked to the invited symposium of SIG7 that focusses on technology-enhanced learning in professional domains.

Learning from an applied online learning platform: Insights into Tuebingen's Sectio Chirurgica

Presenting Author:Johannes Großer, Leibniz Institut für Wissensmedien, Germany; **Co-Author:**Martina Bientzle, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:**Thomas Shiozawa, University of Tuebingen, Germany; **Co-Author:**Bernhard Hirt, University of Tuebingen, Germany; **Co-Author:**Joachim Kimmerle, Leibniz-Institut für Wissensmedien, Germany

Although lecture captures are a common and often used format to teach (anatomical) knowledge, these formats often suffer of low comprehensibility, conceivability, and entertainment compared to more applied formats that specifically aim to present actions and interactions of professionals in a realistic setting. In a randomized controlled study with 114 participants, we could demonstrate that participants show a better knowledge performance when they learned from the applied clinical format of Tuebingen's Sectio Chirurgica than compared to a classical lecture capture of the same content. We discuss these results against the background of motivational factors that could explain these performance differences.

Dynamic vs. static tutorials for learning to operate software: both work!

Presenting Author:Mireille Betrancourt, University of Geneva, Switzerland; **Co-Author:**Kristina Pankov, University of Geneva, Switzerland

With the increased popularity of "How to" videos on social networks, there is a general assumption that people learn better and are more engaged with videos than with static instructions. The present study aimed to assess the effectiveness of the video-based instructions compared to the static equivalent for learning to operate software. Following the recommended instructional design guidelines for software learning, two conditions were developed: dynamic (video based) & static (on-screen presentation) tutorial. Thirty participants (mean age 38) were randomly assigned to the experimental conditions. After studying the material and performing a short interfering task, they had to complete a retention test (declarative knowledge), and perform the same procedure on a different document (procedural knowledge). Then they answered an attitude questionnaire (motivation, perceived difficulty, and effort). Results showed no significant difference in declarative and procedural performances between conditions, participants scoring very high on both tests. Regarding non-cognitive outcomes, participants in both conditions found the material very motivating and of low difficulty but declared allocating some effort to learn. These findings suggest that static and dynamic instructions are equally effective to learn how to operate software when they are designed according to guidelines derived from research. Future studies will try to assess whether these findings can be replicated for more complex procedures.

The development of self-efficacy for negotiating during a four-day simulation of decision-making.

Presenting Author:Sofie Vermeiren, University Antwerp, Belgium; **Co-Author:**Dorothy Duchatelet, University of Antwerp, Belgium; **Co-Author:**David Gijbels, University of Antwerp, Belgium

Simulations of decision-making are increasingly being used as teaching tools in political science, yet evidence of their pedagogical effectiveness is largely anecdotal. The few empirical studies that do exist are mainly focusing on cognitive learning outcomes and have little eye for affective learning outcomes such as self-efficacy. Aims of this study are twofold. First, it wants to explore the development of students' self-efficacy for negotiating during a four-day simulation of decision-making. Second, it wants to investigate how variation in self-efficacy for negotiating relates to student differences (gender and experience) and learning environment differences (students' role and preparation). The research was conducted during EuroSim 2018, a four-day comprehensive simulation of EU decision-making. Data was collected from 140 (under-)graduate students from 16 different European and American universities. Self-efficacy for negotiating was measured across 4 points in time. Data were analysed using repeated measures one-way ANOVA and independent t-tests. In contrast with results from previous studies, findings showed no significant effect for the development of students' self-efficacy over time and its relation with experience and preparation. However, results confirmed that gender and students' role have a role to play when probing into how students vary in their self-efficacy for negotiating. Findings point to both learning environment and student differences that need to be considered when increasing our understanding about variation in students' self-efficacy for negotiation. More specifically, the role students act out during the simulation and its impact on the students' learning process and outcomes should not be underestimated.

The Effects of Problem-Based, Project-Based, and Case-Based Learning on Motivation: A Meta-Analysis.

Presenting Author:Lisette Wijnia, HZ University of Applied Sciences & Erasmus University Rotterdam, Netherlands; **Co-Author:**Gera Noordzij, Erasmus School of Social and Behavioural Sciences, Erasmus University Rotterdam, Netherlands; **Co-Author:**Lidia Arends, Erasmus School of Social and Behavioural Sciences, Erasmus University Rotterdam, Netherlands; **Co-Author:**Remigius (Remy) Rikers, UCR / Utrecht University, Netherlands; **Co-Author:**Sofie Loyens, University College Roosevelt, Netherlands

Student-centered learning methods, such as problem-based (PBL), project-based (PjBL), and case-based learning (CBL) are becoming increasingly popular. It is often assumed that these learning environments can enhance students' motivation toward learning. The goal of this meta-analysis was to examine the effects of PBL, PjBL, and CBL on students' motivation. Motivation is viewed as a multifaceted construct consisting of students' control beliefs (e.g., self-efficacy), attitude toward learning, task value (e.g., interestingness of the task), and students' goals or reasons for studying (e.g., intrinsic or autonomous motivation). We conducted a literature search (i.e., published and gray literature) and eventually included 186 reports in the meta-analysis that reported outcomes for 212 subsamples. In these studies, 113 subsamples investigated the effectiveness of PBL, 79 the effects of PjBL, and 20 the effects of CBL on motivation. Overall a small positive effect ($d = 0.398$) was found for PBL, PjBL, and CBL on motivation. However, the effect was heterogenous and moderator analyses revealed that school and implementation level, publication status, and quality of the motivational measure moderated the effectiveness of the three learning methods on motivation. Specifically, effect sizes were smaller for studies with K-12 samples, curriculum implementations, unpublished studies, and motivational measures rated high in quality. Furthermore, analyses suggested differential effects of the type of learning method on students' attitudes: a larger effect was found for PjBL and CLB relative to PBL environments.

Session U 2

16 August 2019 15:30 - 17:00

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Culture, Morality, Religion and Education

Finding purpose in education – A perspective of professionals

Keywords: Morality, Professions and applied sciences, Religious studies, Values education

Interest group: SIG 19 - Religions and Worldviews in Education

Chairperson: Alexander Unser, TU Dortmund University, Germany

Organiser: Elina Kuusisto, University of Humanistic Studies, Netherlands

Discussant: Doret de Ruyter, University of Humanistic Studies, Netherlands

This symposium discusses what kind of purposes do different professionals in schools have, namely school leaders, teachers, and social services professionals. Purpose in life can be seen as a key factor in promoting professional and personal growth and resilience. As a result, in many countries around the world, the purpose of education and the role of schools and universities in supporting the development of purpose are increasingly important topics of scientific research and educational debate. Schools and universities are under pressure to create effective, supportive, and challenging environments in which students can learn skills, dispositions, and actions to direct their lives successfully. This educational charter also means that education extends beyond the acquisition of knowledge or increasing one's cognitive capacities to develop the whole person, including emotion, motivation, volition, spirituality, and sociality. This symposium discusses the role of purpose in educational professions and whether different professionals of the school community have found their purpose

in education. The symposium presents empirical studies from Finland, Germany and The Netherlands. The studies illustrate how professional and personal spheres of life are intertwining in educational professions.

How do Finnish teachers' life goals actualize in their profession?

Presenting Author:Elina Kuusisto, University of Humanistic Studies, Netherlands; **Co-Author:**Kirsi Tirri, University of Helsinki, Finland

This study investigates how teachers' life goals actualize in their profession. The study builds on Damon, Menon, and Bronk's (2003) definition of purpose, which is "a stable intention to accomplish something that is both meaningful to the self and of consequence beyond the self over time" (Damon, Menon, & Bronk, 2003, p. 212). Within this framework life goals that include other-focus can be regarded as authentic purposes. Participants include Finnish student teachers from the University of Helsinki (N=921) and in-service teachers from one Finnish basic education school (N=77). Data were gathered in two phases. First, student teachers answered a survey that included Roberts and Robins' (2000) Life goals –questionnaire, and an open-ended question "What is your purpose in life?" (Magen, 1998). In the second phase, in-service teachers answered the same open-ended question as the student teachers and a question designed for this study "How is teaching related to your purpose in life?" The results show that the most important life goals of Finnish teachers are happiness and close relationships. Only 13 percent of the both student and in-service teachers linked teaching to their life purpose, however, when the connection was asked directly nearly 80% of the teachers saw that their profession as instrument to realize their life goals. Even though majority of the life goals were self-focused, this study indicate that all kind of life goals, even hedonistic ones, can potentially be authentic purposes and include beyond-the-self dimension.

Critical or positive effects of a religious calling to teach? A study among evangelical teachers

Presenting Author:Sebastian Röhl, University of Education Freiburg, Germany; **Co-Author:**Manfred L. Pirner, University of Erlangen-Nuremberg, Germany

Several studies have pointed out that many teachers understand their profession as a kind of calling, which tends to go along with a heightened sense of the purpose and meaning of their work. Various authors have discussed controversially whether this perception has a positive or rather critical impact on professional practice. This empirical-quantitative study examines effects of the belief in a religious calling among evangelical teachers, where this phenomenon seems to be particularly prevalent. An overall review of studies from occupational psychology on calling, without distinction between a religious and a more general understanding, shows positive effects on life- and work-satisfaction. Explorations of evangelical literature indicate that these authors' understanding of calling carries a strong emphasis on religious interpretations and values. Analyses using two employee surveys (n=217) from German evangelical schools confirm the strong prevalence of a belief in a religious calling as well as positive correlations with work- and life-satisfaction. An increased risk of burnout was not observed.

Finnish Social Services Students' Perceptions of Purpose and Helping

Presenting Author:Niina Manninen, University of Helsinki, Finland; **Co-Author:**Elina Kuusisto, University of Humanistic Studies, Netherlands; **Co-Author:**Kirsi Tirri, University of Helsinki, Finland

This study presents Finnish social services students' (N=151) conceptions of life purposes and helping with the research questions: What kind of purpose profiles do the students' exhibit? How do the students in different profiles perceive the role of purpose and helping? Purpose is a higher order long term life goal that is personally meaningful and also benefits the world beyond oneself (Damon, Menon, & Bronk, 2003). Therefore, purpose could be integral in directing the students and especially their helping goals. The study uses mixed methods with Likert scale and open answers. Based on Likert scales the profiles of Dabblers (n=57), Purposeful (n=38) and Dreamers (n=27) were found. Within open answers, the students perceived the role of purpose as leading a happy and pleasurable life rather than good or value-driven life. Most of the students did not address values in their lives or in helping unknown others. Supporting the students to find their purpose in life during their education could promote their wellbeing and committed work practices. Purposeful people are also more capable of facilitating others to find their purpose in life which is important in social services work as a moral practice.

Purposeful visions for the future - School leaders formulating aims for education

Presenting Author:Jorien Copier, Radboud University, Netherlands

Purposes (Damon, 2009) or aims (Noddings, 2003, 2008) are the highest strivings in education. They cannot be aimed for directly, are hard to measure and are closely related to our most profound ideals (Noddings, 2003, 2008). Biesta (2009, 2010) has shown that the discourse on educational aims easily turns into a technical and managerial discussion on effects, results and statistics. The more profound, normative question on the purpose of education is often not addressed. School leaders have an important role in keeping up the dialogue on the purpose of education in their schools. Part of their leadership is to envision an attractive future for the school community (Avolio & Yammarino, 2013). This contribution scrutinizes how school leaders formulate a future vision for the pupils at their schools and to what extent these future visions contain purposes. The study consisted of a qualitative interview with 26 school leaders of primary schools in the Netherlands. The content analysis shows that school leaders have several ideals for the future for (the pupils of) their schools. However, de data shows that the same ideals can be formulated both; as instrumental, measurable goals and as profound, transcending purposes. The results of this study strengthen the theoretical understanding of aims and purposes by qualitative empirical interview data. The diagnose that results from this study can help school leaders and school leader training programmes to sharpen their focus on purposeful education.

Session U 3

16 August 2019 15:30 - 17:00

Lecture Hall - H07

Symposium

Cognitive Science

Beyond SFON: expanding examinations of spontaneous mathematical focusing tendencies

Keywords: Cognitive development, Cognitive skills, Developmental processes, Early childhood education, Mathematics, Numeracy, Primary education, Qualitative methods, Quantitative methods

Interest group:

Chairperson: Jake McMullen, University of Turku, Finland

Organiser: Lieven Verschaffel, KU LEUVEN, Belgium

Organiser: Jake McMullen, University of Turku, Finland

Discussant: Matthew Inglis, Loughborough University, United Kingdom

Until recently, individual differences in the development of mathematical skills have almost exclusively been studied using overtly mathematical tasks. However, a novel approach using non-explicitly mathematical tasks has revealed that not all children equally focus on mathematical aspects when not guided to do so. Children's tendency of Spontaneous Focusing On Numerosity (SFON) has been found to predict individual differences in early numeracy and mathematical development throughout primary school. A higher SFON tendency is thought to trigger more self-initiated practice with numerical skills in children's everyday lives, which leads to advantages in learning mathematics. This symposium includes four empirical studies which build on the previous findings of SFON studies by extending this work to examine children's spontaneous mathematical behavior with other mathematical aspects and by examining how both perceptual and educational contexts effect spontaneous mathematical focusing. The first contribution investigates young children's' spontaneous focusing on patterns in play situations. Next, the second contribution examines the effects of perceptual salience on SFON tendency in young children. The third contribution extends this general line of research to other domain-general skills, by examining the relation between spontaneous focusing on quantitative relations, mathematics achievement, and relational reasoning. Finally, the fourth contribution describes the role formal and informal schooling may play on SFON tendency in the frames of other early mathematical competences. This collection of studies suggests that these kinds of mathematical focusing tendencies may be an efficient tool for promoting children's mathematical development and preventing later failures in learning mathematics.

Four-year olds' Spontaneous Focusing On Patterns

Presenting Author:Lieven Verschaffel, KU Leuven, Belgium; **Co-Author:**Nore Wijns, KU Leuven, Belgium; **Co-Author:**Bert De Smedt, KU Leuven, Belgium; **Co-Author:**Joke Torbeyns, KU Leuven, Belgium

Recent studies provided empirical evidence for the importance of early mathematical patterning competencies for children's later mathematical development. Whereas this line of research has focused on children's patterning ability, children can also differ in their spontaneous attention towards patterns. This study analyses preschoolers' Spontaneous Focusing On Patterns (SFOP) and its association with their patterning ability and numerical ability. We presented 376 preschoolers ($M_{age} = 4y10m$; 189 boys) a newly developed SFOP task, in which children were invited to create a tower with differently colored blocks, as well as tasks addressing their patterning ability, numerical ability, spatial ability, and visuospatial working memory. About one third of the preschoolers spontaneously created a pattern, 15% sorted the blocks per color, and half of the children made a random construction. Preschoolers' performance on the SFOP task was associated with their patterning ability and numerical ability. Preschoolers' who spontaneously created a pattern had better patterning ability than children in the random group and better numerical ability than children in the sorting group, even while taking into account their spatial ability and visuospatial working memory. The present study adds to our theoretical understanding by looking into SFOP, a mathematical focusing tendency that potentially plays an important role in children's mathematical development. From an educational point of view, it indicates the need for more attention towards patterns in young children's free play.

The effects of perceptual salience on attention to number

Presenting Author:Michele Mazzocco, University of Minnesota, United States; **Co-Author:**Jenny Chan, University of Minnesota, United States

Children's focus on number has been shown to predict concurrent and later mathematics performance (e.g., Hannula, 2005), and the frequency of children's focus on number appears to correlate with their caregivers' attention to number. These findings suggest that it is important to consider ways to naturally increase children's focus on number, such as by intentionally creating play materials that enhance the salience of numerical features. Accordingly, our lab has conducted experimental studies designed to vary and manipulate numerical salience. In earlier work, we showed that attention to number was relatively infrequent among preschoolers and adults completing a simple matching task, but we also showed that we could increase this frequency by reducing the presence of highly salient competing features (such as color) in experimental stimuli. Subsequently, we replicated and expanded this work by a) varying the combinations of competing features to measure the effect on attention to number, with similar findings, b) manipulating whether these features vary within items or within sets, and c) measuring attention to number among children ages 4 to 7 years. Through our findings that manipulating experimental materials can affect the frequency of attention to number in children and adults, our research suggests that intentional design of materials may be an effective way to promote greater "spontaneous" attention to number in naturally occurring materials. Observational lab and field studies are an important next step to address this possibility.

Interrelations among Relational Reasoning, Spontaneous Focus on Math Properties and Math Performance

Presenting Author:Patricia A. Alexander, University of Maryland, United States; **Co-Author:**Zhao Hongyang, University of Maryland, United States; **Co-Author:**Yuting Sun, University of Maryland, United States

Relational reasoning is a foundational cognitive ability to discern patterns in any informational stream. This study examines the associations among Chinese elementary children's relational reasoning ability and their abilities to spontaneously focus on mathematical properties in novel problem-solving tasks and solve traditional mathematical problems. A sample of 143 third to fifth graders in urban southeast China took a Test of Relational Reasoning – Junior, a visuospatial test consisting of four scales tapping four forms of reasoning respectively (i.e., analogy, anomaly, antinomy, and antithesis). They also concurrently completed a task that required spontaneous recognition of patterns of change (including quantitative patterns) depicted in a creative problem situation and applying those patterns to generate a response to a similar problem situation (Spontaneous Focus on Mathematical Relations for Chinese Children), as well as a traditional mathematical test on knowledge of number, algebra, and geometry (Mathematical Ability Test). Intercorrelations of the total scores of these measures showed that the relational reasoning ability was moderately associated with both children's spontaneous focusing on mathematical properties and mathematical test performance. Looking at subcomponents of the three measures, different forms of relational reasoning were found to be differently associated with subcomponents of the spontaneous focusing ability and traditionally measured mathematical abilities. These findings give rise to important theoretical questions.

The effects of first school years on mathematical skill profiles

Presenting Author:Minna M Hannula-Sormunen, University of Turku, Finland; **Co-Author:**Cristina Nanu, University of Turku, Finland; **Co-Author:**Eero Laakkonen, University of Turku, Finland

This study investigated the effect of amount of early formal education on mathematical skill profiles measured by variety of arithmetical skill and Spontaneous Focusing On Numerosity (SFON) tasks. Data were analyzed from 652 4–7-year-old children from four European countries with different school starting ages. A person-centered approach with latent profile regression analyses on four factor-score variables identified six mathematical skill profiles with both qualitative and quantitative differences. The results revealed significant effects of the amount of schooling on mathematical profiles when chronological age and country-specific school entrance age were controlled for. Specifically, when the amount of schooling decreases, children from the profile with the lowest level skills have higher odds of belonging to the second and third highest level profiles. Educational implications of the findings emphasize the heterogeneity in children's mathematical skill profiles and potentially different effects of starting formal schooling across different profiles.

Session U 4

16 August 2019 15:30 - 17:00

Lecture Hall - H09

Symposium

Lifelong Learning

Person-environment congruence and related constructs as predictors of career choices and behavior

Keywords: Developmental processes, Educational Psychology, Lifelong learning, Quantitative methods, Secondary data analysis, Social development, Vocational education

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Manuela Paechter, University of Graz, Austria

Organiser: Silke Luttenberger, University of Teacher Education Styria, Austria

Discussant: Elena Makarova, University of Basel, Switzerland

Vocational interests of individuals are regarded as personality traits that influence career choices as well as job satisfaction. Within this view, the Theory of Vocational Personalities and Work Environments (Holland, 1997) assumes six personality types that describe vocational interests and work environments corresponding to the personality types: Realistic, Investigative, Artistic, Social, Enterprising, Conventional. The theory assumes a direct link between an individual's personality and an environmental (work/task) context. In the theory, congruence (the match between individual interests and characteristics of the environment) as well as differentiation (distinct preferences for specific environments or tasks) are crucial constructs. All contributions of this symposium look closer into these constructs. As an important basis for research, the usefulness of different congruence indices for the fit of interests and aspired professions is discussed and recommendations for their range of application are given. Another contribution then investigates how parents influence their children's interest and distinctiveness of interests. Here, congruence between parent's and children's interest is in the focus. Two other contributions investigate in a longitudinal approach how congruence between interests and career wishes as well as differentiation influence study choices and to which degree congruence and differentiation are able to predict changes in adolescents searching for an apprenticeship.

Bringing these contributions together, the symposium discusses the role of congruence and differentiation for career choices and career behavior in different age groups and on different academic levels (students in school/university/apprentices).

Furthermore, implications for career counseling are presented.

Measures for evaluating congruency of students' interests and their vocational aspirations

Presenting Author:Bernhard Ertl, Bundeswehr University Munich, Germany

Choosing a profession that fits to one's interest is crucial for later job satisfaction. This statement may sound trivial, but the challenge lies in determining how well personal interests and characteristics of an aspired profession fit together. The Holland model provides a framework to classify individual interests and professions into three-letter-codes. Each letter describes interests in a specific domain of activities respectively predominant activities in a profession (realistic/technical, investigative, artistic, social, enterprising, and conventional interests/activities). Fit indices can be calculated to describe congruence between two three-letter codes. The present paper discusses similarities and differences between two fit indices, the C-Index and a vector-based approach, by using two samples (STEM and medicine students) of the German National Educational Panel Study; NEPS). Fit indices were calculated for students' interests and for their most preferred occupation. When comparing in which sample congruence is higher the two fit indices come to different results. With the C-Index medicine students show lower congruency than STEM students; with the vector-based index it is just the opposite. One reason for this result lies in the calculation method for the C-Index. The C-Index only considers similarity between letters in the first, respectively second and third position and does not take identical or similar letters on different positions into consideration. The results have implications for research as well as for practice; for example for career counseling when recommendations are based on congruence indices.

Congruence and differentiation as predictors of changes in career choices among adolescents

Presenting Author:Silke Luttenberger, University of Teacher Education Styria, Austria; **Co-Author:**Gernot Dreisiebner, University of Graz, Austria; **Co-Author:**Michaela Stock, School of Business Economics and Social Sciences, Austria; **Co-Author:**Georg Tafner, University of Teacher Education Styria, Austria; **Co-Author:**Manuela Paechter, University of Graz, Austria

In the process of deciding for a career, adolescents have to identify their interests and abilities and balance them with actual vocational opportunities. Ideally, they should come up with career aspirations that match their interests. The current study investigates in a heterogeneous sample of young adolescence with a wide range of career wishes predictors for changes in career choice according to Holland's (1997) Theory of Vocational Personalities and Work Environments. Altogether, 418 students from 16 pre-vocational schools in Austria took part in a survey on vocational interests, career wishes (t1) and choices (t2), congruence between student's career wishes with vocational interests, and differentiation of interests. In general, results showed lower probability of changes in career choices for students with higher congruence, and lower likelihood of males for changes in career choice. Differentiation had no influence on the probability of changes in career choice. There was a significant interaction between gender and congruence as predictors for changes in career choices. The results advise counselors to consider not only individual vocational interests but also congruence of career wishes and vocational interests. Gender differences should be considered in career counseling, with females experiencing higher insecurity in career choice processes.

Early stages of careers: Using vocational interests to predict person-environment fit at university

Presenting Author:Jakob Bergmann, Johannes Kepler University Linz, Austria; **Co-Author:**Smirna Malkoč, Johannes Kepler University Linz, Austria

According to Holland (1997), vocational interests are significant predictors of vocational choices and outcomes. Considering that making vocational choices might be one of the biggest challenges in the life of adolescents, it seems of special importance to understand this process and to identify underlying factors at different stages. The present study aims to identify factors related to interest-congruent vocational choices at an early career stage, namely the choice of study majors at university. A longitudinal study was carried out in which 584 high school students, all about to graduate soon, filled in a questionnaire; two to four years later, these students, all of them then enrolled in university, again filled in a questionnaire. Linear regression was carried out to identify variables from the first measurement point (in high school) that are able to explain a significant amount of variance in interest-major congruence at the second measurement point (at university). The results mostly agree with Holland's theory, showing that interest consistency, vocational identity, and interest-aspiration congruence positively predict interest-major congruence. However, while interest-aspiration congruence has the strongest relation, the differentiation of interests in occupational fields shows no relation to interest-major congruence. Controlling for personality traits and cognitive abilities results in very little change. The results speak for school and career counseling programs, which focus on exploring vocational aspirations and establishing person-aspiration fit. They, however, show that not all measurements are useful in that context, especially the differentiation of interests which, contrary to expectations, was not related to interest-major congruence.

Are children a sum of mom and dad? Evaluating intergenerational interest patterns

Presenting Author:Florian G. Hartmann, University of the Bundeswehr Munich, Germany; **Co-Author:**Jutta von Maurice, Leibniz Institute for Educational Trajectories (LIfBi), Germany

Although vocational interests play an important role in the study and career choice as well as in job stability and satisfaction little is known about how these dispositions develop. The current study describes and applies a method in which a common parental interest focus is derived from mother's and father's single interest profiles. Thereby, differentiation of mother's and father's interest profiles is taken into account. The combined parental interest focus is then compared to their child's interests. The investigation is based on Holland's theory of occupational choice that distinguishes between six ideal personality types. Measuring the resemblance of a person to these six types a personal interest profile can be derived and the focus of interest can be determined. This approach is applied to the data of 197 students and their parents. The results indicate that a student's focus of interest is congruent to the common parental interest focus. Since the congruency has its limits future studies should try to additionally use the information about the vocational interests of other family members, partners and friends.

Session U 5

16 August 2019 15:30 - 17:00

Lecture Hall - H08

Symposium

Perspectives for Understanding - and Designing for - Transfer

Keywords: Cognitive development, Cultural psychology, Design based research, Educational Psychology, Higher education, Learning approaches, Philosophy, Social aspects of learning and teaching, Social interaction, Technology

Interest group: SIG 25 - Educational Theory

Chairperson: Nina Bonderup Dohn, University of Southern Denmark, Denmark

Organiser: Nina Bonderup Dohn, University of Southern Denmark, Denmark

Organiser: Michael Jacobson, The University of Sydney, Australia

Discussant: Peter Reimann, University of Sydney, Australia

A recurrent debate within the educational research community is how to conceptualize and design for transfer. Some researchers have viewed transfer as straightforward knowledge retention and reactivation (Gagné, Wager, Golas, & Keller, 2005). Others have employed more cognitively nuanced theorizing (Goldstone & Day, 2012). These perspectives view learning for transfer as a *design challenge*: how to design for learners to construct knowledge (e.g., schemas, mental models) that can be flexibly accessed and used in new contexts. Conversely, situated learning theorists have questioned the meaningfulness of the transfer concept (Lave, 1988) or have stressed that designing for transfer concerns how teachers *frame* the learning activities as relevant beyond the immediate context (Engle, 2006). The aim of this symposium is to provide current perspectives on these debates. Papers will focus on theoretical conceptualizations of transfer, their learning design implications, and their corroboration through empirical research. Structure of the symposium: Presenters and discussant: each 12 minutes. Small audience group discussions: 10 minutes. General discussion: 20 minutes. Engle, R. A. (2006). Framing Interactions to Foster Generative Learning: A Situative Explanation of Transfer in a Community of Learners Classroom. *Journal of the Learning Sciences*, 15(4), 451-498. doi:10.1207/s15327809jls1504_2Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2005). *Principles of instructional design* (5. ed.). Belmont, CA: Thomson/Wadsworth. Goldstone, R. L., & Day, S. B. (2012). Introduction to New Conceptualizations of Transfer of Learning. *Educational Psychologist*, 47(3), 149-152. Lave, J. (1988). *Cognition in Practice*. Cambridge: Cambridge University Press.

Analyzing Knowledge Transfer across Contexts as Situated Attunement to Contextual Possibilities

Presenting Author:Nina Bonderup Dohn, University of Southern Denmark, Denmark

Situative perspectives on learning have questioned the concept of transfer, both as theoretical construct and as empirical phenomenon. The claim is that knowledge is always learnt and exercised situatedly. Yet, mundane examples of children calculating prices in the supermarket and research within cognitive approaches combine to show that we do sometimes put knowledge learnt in one context to use in others. This illustrates the need for elaborating the situative understanding of transfer. Previous work on this focus on micro-level context crossings from one classroom situation to another. It does not address the broader question how 'transfer' can be conceptualized for crossings between disparate contexts, e.g. school and work. This theoretical paper provides such a conceptualization by articulating a view of transfer as transformation of knowledge in situated attunement to contextual possibilities. This is done in three steps. *First*, a view of knowledge as a unity of three aspects is presented: *Propositional knowledge* (know that), *practical knowledge* (know how), and *experiential knowledge* (know of). It is argued that this unity is realized concretely in 'knowing-in-action'. *Second*, a framework for analyzing contextual possibilities is developed. *Third*, I argue that knowledge is developed in attunement to the contextual possibilities of the learning situation. Because contextual possibilities differ between situations, knowledge has to transform between situations. Learners do this in attunement to and negotiation of the contextual possibilities of the new context. Here, the different aspects of their knowledge may play different roles, because they display varying degrees of situativity.

Designing for Transfer as Situated Readiness

Presenting Author:Roland Hachmann, University Southern Denmark, Denmark; **Co-Author:**Nina Bonderup Dohn, University of Southern Denmark, Denmark

This paper focuses on student teachers and their knowledge transfer. It reports on a design experiment utilizing design-based research methodology. It takes its outset in a combination of a practice problem and a research question, investigated through the design experiment. The *Practice Problem* was: *How can a teacher education program improve facilitation of student teachers' development of theoretically founded practical skills within the subject discipline of first language teaching?* The theoretical outset for the study is a sociocultural understanding of knowledge as situated and context dependent and socially mediated in practice. Transfer is accordingly conceptualized as transformation of "acts of knowing". The design experiment was undertaken in a first language course at a Teacher Education Program (TEP) in Denmark. Student teachers were required to teach parts of their own course curriculum at a local primary school. This allowed the investigation of the *Research Question*: *What knowledge is transferred between the TEP course and the primary school class and how is it transformed and resituated?* Methods used were: observation, video recording, interviews, content analysis of assignments. Findings are: student teachers transfer propositional knowledge of curricular content, but often transform and resituate this knowledge through adapting academic terminology, visualizations, and examples. They also transfer activities and practical skills in conducting them. This involves transforming and resituating patterns of participation. A major challenge is the lack (in both settings) of explicit articulation of the differences between the settings as a way to stimulate student awareness of situational demands.

Going digital at the age of two -Transfer, cognitive socialization and the hybrid mind

Presenting Author:Roger Säljö, University of Gothenburg, Sweden

The concept of transfer has played a significant role in psychological research for a long time, in fact since the beginning of modern empirical psychology. The centrality of the concept for the study of learning resides in the fact that the assumption of transfer is foundational to education; students learn in one setting and are expected to utilize what they have acquired somewhere else. At the empirical level, however, transfer has been difficult to prove in research. In the present paper, it is argued that digitization, and the early age at which children now engage with digital tools (primarily tablets), will imply that cognitive practices to an increasing extent will be shared between settings. The reason for this is that digital tools are present in most activities and to an increasing extent they are embedded in the cognitive habits of young people. A problem with the classical interpretation of transfer is that it places transfer within the individual mind, rather than in cognitive practices. If we accept the perspective of the human mind as a hybrid, suggested by Merlin Donald, the omnipresence of digital tools implies that there will be an increasing overlap of knowledge practices between settings, including school and other contexts. The study reported builds on longitudinal research of nationally representative samples of use of digital tools among children as well as in-depth studies of how children engage with tablets in preschools.

Transfer as an Emergent Phenomenon: A Complexity Perspective

Presenting Author:Stig Børsen Hansen, University of Southern Denmark, Denmark; **Co-Author:**Michael Jacobson, The University of Sydney, Australia

Understanding how and why students might (or might not) learn in ways that they can use and apply (i.e., transfer) their knowledge in new settings has been theoretically vexing for many years, with competing perspectives being proposed primarily by cognitive and situative theoreticians. To address this issue, the *Complex Systems Conceptual Framework of Learning* (CSCFL) is used to determine if complexity concepts might overcome limitations in current cognitive and situative theorizing about transfer. An empirical paper about transfer is used as a theoretical case study in which Productive Failure (PF) and a Direct Instruction (DI) instructional treatments were used to help students learn about complex systems and climate change. The PF group was found to perform at a significantly higher level on posttest near within domain and far across domain transfer problems. From a CSCFL perspective, the PF group helped the students construct transferable knowledge that *emerged* from complexity dynamics of *sensitivity to initial conditions* and *nonlinearity* and *across level interactions* related to the sequencing of instruction being delayed compared to the DI group where instruction was initially provided. Further, these complexity sequencing and macro-micro level processes also involved both situated *and* cognitive factors. The change in the initial conditions of the DI group, unfortunately, led to across level interactions where different cognitive processes were engaged, mainly those associated with the construction of rote memory as demonstrated by gains in their posttest declarative knowledge but poor transfer performance. Theoretical implications are discussed.

Session U 6

16 August 2019 15:30 - 17:00

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Higher Education

The hidden curriculum in doctoral education

Keywords: Citizenship education, Doctoral education, Emotion and affect, Informal learning, Peer interaction, Qualitative methods, Researcher education, Social aspects of learning and teaching

Interest group: SIG 24 - Researcher Education and Careers

Chairperson: Soren Bengtsen, Aarhus University, Denmark

Organiser: Soren Bengtsen, Aarhus University, Denmark

Discussant: Kirsi Pyhältö, Finland

The symposium presents the results from four different cross-national studies on the hidden curriculum of doctoral education. The hidden curriculum in doctoral education includes the informal learning challenges that doctoral students are expected to overcome without being directly supported by their supervisors and institutional leaders: Receiving the rightly matched, and rightly timed, practical, moral, and emotional support crucial to timely completion and the development of academic resilience, research momentum, and personal growth. The results conclude that such forms of support are provided not by the formal doctoral programmes and Graduate School initiatives, but are provided by institutionally unrecognised and unacknowledged feedback and support systems such as guardian supervisors, professional networks beyond the institution, peer groups, friends, and family. The symposium discusses how to better integrate such central forms of support into the institutionally sanctioned and approved doctoral curriculum and pedagogies. The contributions present findings on the hidden doctoral curriculum in relation to: international doctoral students' learning trajectories, unexploited possibilities for mentoring schemes and peer group support within the institutional infrastructure, and the wider societal and cultural supporters helping doctoral students to develop researcher identity and integrating researchers into a doctoral ecology bridging institutional, societal and cultural domains. The presenters and discussant come from four different countries:

Denmark, United Kingdom, Australia, and Finland and provide a cross-national, and global, perspective on the challenges, but also unexploited possibilities that await doctoral supervisors and students, but also Graduate School leaders, in the coming decade.

Exposing the hidden curriculum in international doctoral contexts

Presenting Author:Dely Elliot, University of Glasgow, United Kingdom

Doctoral education is arguably a fascinating and complex area of research, more so for the added intricacies and opportunities offered to those who decide to pursue it in a 'foreign' setting. Previously, a number of investigations focused on the impact of 'enculturation' and 'acculturation' to assist learners' effective coping in their new academic and societal setting. The limited attention paid to the distinctive experiences emanating from simultaneously becoming part of two different educational and cultural milieux, exacerbated by the negative connotations previously attached to the hidden curriculum, tend to hinder harnessing their rewards far less searching for them. Employing an academic acculturation model based on Urie Bronfenbrenner's bio-ecological theory, I will aim to elucidate the concept underpinning the hidden curriculum as contextualised in an international doctoral context. There is an argument that although the hidden curriculum often lies at the periphery of the formal structure, its impact should not be underestimated as it can make a significant contribution to meaningful experiences and the successful completion for international doctoral sojourners. In this connection, more in-depth examination of this element of doctoral education and its vital role arguably deserves further attention.

Balancing peer-support and early career workload: reasonable boundaries of peer-mentoring

Presenting Author:Sofie Kobayashi, University of Copenhagen, Denmark; **Co-Author:**Kay Guccione, Glasgow Caledonian University, United Kingdom

High numbers of PGRs experience disorientation, stress and feelings of being overwhelmed as they get to grips with what is required of an 'independent' researcher. Doctoral students can experience many stressors and research on occupational stress in university environments indicates that it is widespread, especially among junior academics. Making sense of developmental experiences can be supported dialogically by good professional relationships, and recent research has mapped a wider set of 'meaningful others', including peer networks, and peer-mentors. One concern though, is that the role of peer-mentor could become inappropriately burdening to the mentor (who is also themselves a PGR under pressure). This project seeks then to define a set of boundaries for peer-mentoring and create a Good Practice Guide that defines the structures, attributes, remit, and limitations of a PGR peer-mentoring approach. We will provide a set of key recommendations to those designing peer-mentoring for new doctoral researchers.

The treasure is hidden among peers

Presenting Author:Camilla Østerberg Rump, University of Copenhagen, Denmark; **Co-Author:**Sofie Kobayashi, University of Copenhagen, Denmark; **Co-Author:**Olga Trolle, University of Copenhagen, Denmark

The anxiety that PhD students experience at the outset of their studies may impede their transition to independent research. So far, research has focused on the risks that PhD students experience during their studies, while this research has its focus on the perceived risks that lead to anxiety as PhD students embark on their studies. Qualitative data was collected in the form of outputs from an inductive exercise named 'No Worries'. The analysis enabled us to describe nineteen themes ranging from concrete problems (e.g. lacking a specific competence) to personal anxiety (e.g. living up to expectations), and quantification of the data indicates that the 'limited time' and 'publishing' are the two most frequent themes of worries. From course evaluations we found that 77% indicate that the exercise to a high or very high degree has supported them in taking charge of their PhD studies. The process of sharing seems to normalize the emotions and structural barriers that new PhD students experience, and further, the experience of helping each other in the exercise supports PhD students in building a community of peers.

The hidden curriculum in doctoral education – Beyond academia and into society

Presenting Author:Soren Bengtson, Aarhus University, Denmark; **Co-Author:**Cally Guerin, University of Adelaide, Australia

Discussions of curriculum in relation to doctoral education are slowly gaining momentum (Bastalich 2016; Gilbert 2009; Green 2012); more recently, we see evidence of interest in the informal curriculum generated through the efforts of supervisors and the support of peers and family/friends (e.g., Elliot, Baumfield, Reid, & Makara 2016; Wisker, Robinson & Bengtson 2017). Running parallel to these discourses is the hidden curriculum that may or may not be aimed at preparing candidates for an academic career, but becomes useful in the world beyond academia in alternative academic or post-academic ("alt-ac" or "post-ac") employment. This paper reports on an Australian study that explored the experiences of Humanities, Arts and Social Sciences (HASS) PhD graduates now working in alt-ac positions. Participants reflected on what they had learned during their doctoral candidacy that was useful in their current work. They claimed that their doctoral education had taught valuable skills and capacities in leadership, project management, cognitive abilities, self-discipline, and communication. Identifying these capacities plays a critical role in designing appropriate professional development programs to accompany the increasingly structured doctoral programs seen in Australian and UK universities.

Session U 7

16 August 2019 15:30 - 17:00

Lecture Hall - H11

Symposium

Learning and Social Interaction

Classroom talk that promotes student learning, participation, and communication

Keywords: Argumentation, Conversation/ Discourse analysis, Early childhood education, Instructional design, Language (L1/Standard Language), Quasi-experimental research, Secondary education, Social interaction, Student learning

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Chiel vander Veen, VU University Amsterdam, Netherlands

Chairperson: Anke Wischgoll, University of Fribourg, Switzerland

Discussant: Christa Asterhan, Hebrew University of Jerusalem, Israel

Since over four decades, researchers in the educational sciences are interested in the study of classroom talk in order to identify interactions that promote participation, communication, and student learning. A growing body of evidence indicates that not monologic but dialogic approaches to classroom talk support student learning. Dialogic classroom talk can be characterized by teachers encouraging students to participate, share their ideas, reason, and think together. In this symposium, we aim to build on this body of research by presenting the results of international studies from four different countries on dialogic classroom talk focusing on student learning. The contributions to this symposium on classroom talk illustrate current research in the context of various subjects and with students in a broad age range by reporting on multiple outcomes. In the first paper, the authors will use a large data-set to show what specific forms of teacher-student interaction promote student participation and cognitive engagement with others' ideas. The second paper will present on a quasi-experimental study in which the effect of dialogic classroom talk on students' critical thinking was studied. The third paper will show how mathematics teachers encourage students to participate in discussions and how this relates to the quality of their contributions. Finally, the fourth paper will present on the effects of dialogic classroom talk on student's communication and social skills. All in all, this symposium aims to give a rich image of different international approaches to dialogic classroom talk in relation to participation, communication skills, and student learning.

What forms of teacher-student dialogue and active student participation are productive for learning?

Presenting Author:Sara Hennessy, University of Cambridge, United Kingdom; **Co-Author:**Neil Mercer, University of Cambridge, United Kingdom; **Co-Author:**Elisa Calcagni, University of Cambridge, United Kingdom; **Co-Author:**Alvin Leung, University of Cambridge, United Kingdom; **Co-Author:**Joyce Lim, University of Cambridge, United Kingdom

Dialogic approaches based on active student participation, open, respectful discussion, and critique of different perspectives are increasingly found to support student learning. However, the specific productive forms of teacher-student interaction have rarely been studied systematically. Our own recent large-scale

project related variation in classroom dialogue to learning outcomes for students aged 10-11 in primary school classrooms. Our objective in this follow-up study was to generate rich insights into the forms of dialogue observable within classes achieving higher and lower learning gains in literacy and mathematics. 109 transcripts of English, mathematics and science lessons coded turn by turn were analysed combining corpus linguistics methods with qualitative analysis. The three co-occurring aspects of dialogue that had predicted learning were examined in their temporal context: Elaboration; Challenging or disagreeing; Student Participation – multiple students engage with others' ideas. New distinctions within these categories were generated. In classrooms with higher dialogue and achievement, teachers often invited justification, elaboration and comparison of viewpoints. Productive teacher-led dialogues were characterised by explicit goals framing open-ended discussion tasks and a supportive and inclusive classroom climate of accepting and comparing multiple perspectives, including sequences with students' or teachers' challenges with argumentative components. Teachers withheld evaluation, offering specific feedback acknowledging students' contributions. The findings offer significant contributions to our understanding of which forms of students' cognitive engagement with others' ideas support learning, and how teachers can promote these. Outcomes have fed into an extensive professional development resource pack that has been trialled internationally.

The Respectful Talk model: critical thinking through dialogue – effects on pupils at risk

Presenting Author:Chiel vander Veen, VU University Amsterdam, Netherlands; **Co-Author:**Marjee J. Davies, The University of Auckland, New Zealand; **Co-Author:**Katharina Kiemer, Universität Augsburg, Germany

Equity in education is still a problem for many countries, so as well in New Zealand (OECD, 2014). However, recent research provides evidence that dialogic teaching is a pedagogy that benefits all pupils (O'Connor et al., 2017), opening the possibility for more equitable education. Moreover, dialogic teaching possesses the capacity to develop critical thinking in pupils (Murphy et al., 2018), a competence demanded by New Zealand's standardized national secondary assessment (Hipkins et al., 2016). In this study we examine the effects of a classroom intervention based on a newly developed framework (Respectful Talk model), synthesizing research on dialogic teaching and different perspectives on critical thinking, for secondary pupils' critical thinking skills. The longitudinal quasi-experimental study indicated positive effects of the intervention on pupils' critical thinking, regardless of cultural or socio-economic background. We discuss our findings in light of current research on talk-intensive pedagogies, equity and teacher professional development and propose implications for secondary education.

Prompting for accountability – how to foster students to contribute to math classroom discussions

Presenting Author:Anke Wischgoll, University of Fribourg, Switzerland; **Co-Author:**Miriam Schmid, University of Freiburg, Switzerland; **Co-Author:**Miriam Moser, University of Fribourg, Switzerland; **Co-Author:**Matthias Zimmermann, University of Fribourg, Switzerland; **Co-Author:**Kurt Reusser, University of Zurich, Switzerland; **Co-Author:**Christine Pauli, University of Fribourg, Switzerland

Although classroom discussions take up a large part of instructional time, teachers often struggle in using classroom discussions effectively to foster understanding. However, teachers who support students to participate accountably with regard to the community, to knowledge, and to reasoning, foster students in terms of developing ideas and strengthen their ability to apply subject-specific language. We examined in this study (1) what kind of prompts teachers applied to encourage their students to participate accountably and in subject-specific manner and (2) how function and content of the teachers' prompts were related to the impact of the students' participation. Therefore, we applied qualitative analyzes with regard to function and content of the teachers' prompts and with regard to the students' participation during videotaped classroom discussions of four mathematics classes (8th graders) before and after a teacher professional development program (TPD) on leading classroom discussions. Results revealed that after the TPD the teachers applied prompts to involve more students into the classroom discussion and to encourage them to participate in a more elaborated way than before the TPD. The students' contributions are stronger characterized by subject-specificity and elaborateness than before the training.

Dialogic classroom talk in early childhood education: Effects on communication and social skills

Presenting Author:Chiel vander Veen, VU University Amsterdam, Netherlands; **Co-Author:**Femke van der Wilt, VU Amsterdam, Netherlands

Several studies have shown the great potential of dialogic classroom talk for children's subject-matter learning, reasoning skills, motivation, and language abilities. Surprisingly, many classrooms still show a prevalence towards monologic talk that is overly teacher-steered and mainly focused on the recitation of knowledge. In this paper, we will report on three studies – involving almost 40 teachers and over 1000 children - in which we designed, implemented, and evaluated an intervention that aimed to promote dialogic classroom talk in early childhood classrooms. We evaluated the effects of our intervention on the teacher's use of dialogic talk moves and children's oral communicative competence and social competencies. Results of these studies indicate (1) that early childhood teachers are able to make their interaction more dialogic, (2) that this has a positive effect on children's oral communicative competence, and (3) that dialogic classroom talk might also improve the classroom climate and children's social skills.

Session U 8

16 August 2019 15:30 - 17:00

Lecture Hall - H05

Symposium

Higher Education, Teaching and Teacher Education

From Knowledge to Acting: Aptitude and Qualification in Diagnosing and Promoting Teaching Competency

Keywords: Assessment methods and tools, Competencies, Content analysis, In-service teacher education, Mixed-method research, Pre-service teacher education, Teaching approaches, Teaching/instruction, Video analysis, Vocational education

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Matthias Baer, University of Education Zurich / University of Zurich, Switzerland

Organiser: Matthias Baer, University of Education Zurich / University of Zurich, Switzerland

Discussant: Judith Gulikers, Wageningen University, Netherlands

Professionalism, efficacy of training and further education of teachers and effects of professional experience should be evaluated according to what extent (prospective and experienced) teachers prove to be competent to initiate and support students' learning processes in a way that they are able to achieve deep understanding in order to obtain knowledge *and* ability for acting. Competences as dispositions for overcoming situational challenges, e.g. teaching, can be acquired basically (qualification hypothesis; Kunter et al., 2011a). However, there are numerous instances regarding the influence of personality characteristics, e.g. cognitive abilities, self-efficacy, fundamental motives and goal orientations regarding professional development, professional success, demands up to burnout. Differences for job-related competences exist based on rather stable personality characteristics (aptitude hypothesis; Mayr, 2016). Since (further) development of competences requires an active involvement (deliberate practice; Ericsson, 2011), personality characteristics may have a more or less productive effect on this necessary involvement. The four contributions are based on videographed lessons taught by prospective and experienced teachers or refer to lesson planning. According to the qualification hypothesis, contributions 1-3 include diagnoses regarding

- structuring in lesson planning- how teachers initiate potentially cognitive and meta-cognitive activities during lessons
- how teachers in mathematics lessons act formative-diagnostics. Contribution 4 refers to the aptitude hypothesis. Based on an intervention which promoted competence-oriented, (co-)constructivist teaching, implications of personality characteristics are addressed. If the qualification hypothesis, based on the COACTIV study (Kunter et al., 2011b), has been at the forefront regarding teachers' professionalization, the aptitude hypothesis will be addressed in the symposium as well.

Structuring in Lesson Planning As a Prerequisite for Classroom Management

Presenting Author:Matthias Krepf, Universität zu Köln/ University of Cologne, Germany; **Co-Author:**Johannes König, University of Cologne, Germany

Classroom management consistently applies as a central basic dimension of teaching quality (Hattie, 2009; Wang, Haertel & Walberg, 1993). A central prerequisite for effective classroom management is the planning of lessons. So far, however, there are only a few empirical studies on the modeling and

measurement of planning competence of teachers. For successful planning teachers need knowledge (underlying dispositions), but it is largely unclear which knowledge aspects are of central importance in the planning of lessons (situation-specific-skill). The presented research focuses on this and aims to measure structuring as an aspect of the situation-specific ability of planning competence. To this end, we have developed a standardized method for analyzing written lesson plans in order to be able to use appropriate indicators (content analysis criteria) to reconstruct and quantify situation-specific planning perception, interpretation, and decision-making in terms of structuring. In the presented study, 211 written lesson plans of 106 trainee teachers (one lesson plan at the beginning and end of the traineeship) from the PlanvoLL-project (König et al., 2015) form the data base. The evaluation of the lesson planning is done using content analysis method on the basis of deductively formed categories. The codings were then quantified. The results of this investigation provided clear evidence to a meaningful empirical modeling of this construct. This proves the reliable and valid measurement of the evaluated lesson plans.

Potentials of Cognitive Activation in Classrooms – Findings of a Video Study in Switzerland

Presenting Author:Doreen Holtsch, University of Teacher Education St.Gallen, Switzerland; **Presenting Author:**Juergen Seifried, University of Mannheim, Germany

Empirical research shows that for the acquisition of competences, the cognitive activation of the learners is highly important. However, research on commercial vocational education and training (VET) primarily focused on teachers' content knowledge and pedagogical content knowledge. Among others, this raises the question how VET-teachers tap the potential of cognitive activating activities. Referring to this question, the presentation is focused on "Economy and Society" (E&S), the core subject of commercial vocational training. Reported are results that are based on video data from the Swiss Leading House LINCA. It was collected from nine classes, each taught in three consecutive E&S lessons while the teacher's teaching was videographed. The analysis of the video data consisted of event sampling codings which covered measures for the potential of cognitive activation at six different levels of quality (from simply remembering up to transferring knowledge). The results show that the cognitive activation in E&S lessons are primarily based on impulses from the teacher, not on those from the learners. Overall, the cognitive learning activities are initiated at a rather low cognitive activation level, e.g. activation of prior knowledge, knowledge organization and knowledge explanation. Furthermore, while in teacher-learner interactions the cognitive activation in 62% of the events relates to activating (pre-)knowledge, in 48% VET-teachers used their inputs simply for explaining the lesson's content. In accordance with the qualification hypothesis, such results provide the opportunity to shape teacher education as well as advanced training with experienced teachers in consideration of this empirical evidence.

Teachers' Formative Assessment in Videographed Lessons in Relation to Their Knowledge and Beliefs

Presenting Author:Merle Ruelmann, University of Teacher Education of Lucerne, Switzerland; **Presenting Author:**Sandra Zulliger, Institute for Diversity in Education, Switzerland; **Co-Author:**Buholzer Alois, Institute for Diversity in Education, Switzerland; **Co-Author:**Matthias Baer, University of Education Zurich / University of Zurich, Switzerland; **Co-Author:**Andrea Häfliger, University of Teacher Education of Lucerne, Switzerland; **Co-Author:**Hanni Löttscher, PH Luzern, Switzerland; **Co-Author:**Loredana Torchetti, University of Teacher Education of Lucerne, Switzerland

Diagnostic information gained "on the fly" during lessons is of central importance for teachers' ongoing teaching as well as for their students' learning. On its basis teachers make learning-relevant decisions and justify them (Praetorius & Südkamp 2017). The presentation is based on a video research study in which teachers' strategies for formative assessment in primary school mathematics lessons are examined – together with their professional knowledge and beliefs about learning, diagnosing and assessing. The research goal is to shed light on an empirical basis on assumed relations between teachers' formative-diagnostic actions and their knowledge and beliefs. 52 teachers in Central Switzerland and their students (N=621) participated in the research project. They were videographed while teaching the first two of a total of eight mathematics lessons with which grade 4 students were introduced into what in Switzerland is called "half-written division". All of the 90 minutes video recordings were coded on the basis of a self-developed category system in order to analyze the formative-diagnostic strategies teachers applied in the videographed lessons (time samplings of 10' duration). In addition, data on the teachers' professional beliefs about learning, assessing and diagnosing collected by means of questionnaires were analyzed and are statistically related (regression analyses) to the video codings. The data collection of the study was completed in July 2017. Currently the data from the video codings as well as from the questionnaires is prepared for regression analyses. At the time of EARLI 2019 the results of these statistical calculations will be presented.

Teachers' Personality Aspects and Their Impact on Developing Competences for High Quality Teaching

Presenting Author:Miriam Kocher, University of Education Zurich, Switzerland; **Presenting Author:**Anna Locher, FHNW / University of Cologne, Switzerland; **Co-Author:**Matthias Baer, University of Education Zurich / University of Zurich, Switzerland

Besides competences, teachers' personality characteristics are considered as being of importance for the acquisition of teaching competences (Mayr, 2016). Particularly, self-efficacy beliefs and the personality traits «Big Five» («neuroticism», «openness», «extraversion», «conscientiousness», «agreeableness») are increasingly being discussed for possible impacts. Such rather stable characteristics could, for example, provide the basis for (prospective and experienced) teachers' willingness to develop, respectively further develop competences for high-quality teaching. However, hardly any empirical studies are available in which the acquisition of competences together with personality characteristics are examined. The presentation focuses on this relation. It relies on an intervention over three semesters conducted at Zurich University of Teacher Education. Its aim was to promote competences of prospective and experienced primary school teachers (intervention groups, IG, I and II) for high-quality teaching more distinctively due to its explicit video-based and research-oriented direction compared to the competences of prospective teachers attending the established curriculum and experienced teachers who didn't participate in the intervention (control groups; CG I and II). Over four timepoints, the results show significant higher increases in teaching quality for IG I and II compared to CG I and II, and concerning «teacher-related self-efficacy beliefs» and the personality traits «conscientiousness» and «agreeableness» for IG I. The most interesting result, however, is that the «teacher-related self-efficacy beliefs» and the personality trait «neuroticism» (= low emotional stability) had a significant negative impact on the development of teaching quality for IG I, thus highlighting a debilitating impact of rather stable personality characteristics on basically acquirable competences.

Session U 9

16 August 2019 15:30 - 17:00

Seminar Room - S11

Workshop

Instructional Design

Exploring How to Guide Effective Student Questioning

Keywords: Communities of learners, Design based research, Inquiry learning, Primary education

Interest group: SIG 20 - Inquiry Learning

Chairperson: Christopher Osterhaus, Ludwig-Maximilians-Universität, Germany

Student questioning is an important self-regulative strategy which has multiple benefits for teaching and learning. Teachers, however, need support to align their students questions to curricular goals, or in other words to guide effective student questioning. In this workshop participants will be introduced to the results of longitudinal design-based research: a principle-based scenario that supports teachers in guiding effective student questioning. In the scenario mind mapping is used to provide both structure to curricular content as well as support for student questioning. To raise multiple relevant questions about the core curriculum to be addressed, an adapted version of the Question Formulation Technique is applied. In this highly interactive workshop hands-on experience will be alternated with the presentation of design principles and the theoretical underpinnings of the scenario.

Exploring How to Guide Effective Student Questioning

Presenting Author:Harry Stokhof, HAN University of Applied Sciences, Netherlands

Student questioning is an important self-regulative strategy which has multiple benefits for teaching and learning. Teachers, however, need support to align their students questions to curricular goals, or in other words to guide effective student questioning. In this workshop participants will be introduced to the results of longitudinal design-based research: a principle-based scenario that supports teachers in guiding effective student questioning. In the scenario mind mapping is

used to provide both structure to curricular content as well as support for student questioning. To raise multiple relevant questions about the core curriculum to be addressed, an adapted version of the Question Formulation Technique is applied. In this highly interactive workshop hands-on experience will be alternated with the presentation of design principles and the theoretical underpinnings of the scenario.

Session U 10

16 August 2019 15:30 - 17:00

Seminar Room - S06

Workshop

Higher Education

Sharing our experiences of putting interdisciplinary theory into (hands-on) educational practice

Keywords: Collaborative Learning, Higher education, Interdisciplinary, Problem solving

Interest group: SIG 04 - Higher Education

Chairperson: Kerstin Baeuerlein, University of Applied Sciences and Arts Northwestern Switzerland, Switzerland

The arguments for increasing the amount of interdisciplinary activities in higher education are both plentiful and compelling: However, the disparity between arguments for interdisciplinary education and its practical application is stark.

For the past years, the three organisers of this workshop have been developing ways in which academic theory and physical interactions can be combined to both teach interdisciplinarity, and to enable effective interdisciplinary collaborations. The methods have been used in various higher educational settings, but have, so far, not been combined.

The aim for this workshop is thus to compare, discuss and, most importantly, put into use these practical ways to facilitate interdisciplinary teaching and learning. These methods are "the Pressure Cooker", "CoNavigator" and the "blended interdisciplinary research talent honours-programme" (BIRTH).

Sharing our experiences of putting interdisciplinary theory into (hands-on) educational practice

Presenting Author: Katrine Lindvig, University of Copenhagen, Denmark; **Co-Author:** Merel van Goch, Utrecht University, Netherlands; **Co-Author:** Michael Burke, Utrecht University, Netherlands

The arguments for increasing the amount of interdisciplinary activities in higher education are both plentiful and compelling: However, the disparity between arguments for interdisciplinary education and its practical application is stark.

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Session U 11

16 August 2019 15:30 - 17:00

Seminar Room - S15

Workshop

Instructional Design

Get Inspiration for Scalable Design in Open Online Education

Keywords: Computer-supported collaborative learning, E-learning/ Online learning, Peer interaction, Qualitative methods

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Sari Yrjänäinen, University of Turku, Finland

This workshop will illustrate how the scalability of the educational design of Massive Open Online Courses (MOOCs) can be analysed, using our design analysis instrument. The instrument is developed to get inspired by the current (best) practices in MOOC design. Participants will practice analyzing the educational design of MOOCs focusing among other things on constructive alignment between learning goals and learning activities, scalable formative feedback and assessment and student interaction using the design analysis instrument. Additionally, we will present case examples of current scalable best practices of MOOC design. The workshop is interesting for everyone who wants to learn more about scalable design, experienced as well as inexperienced.

Get Inspiration for Scalable Design in Open Online Education

Presenting Author: Julia Kasch, Welten Institute - Open University of the Netherlands, Netherlands; **Co-Author:** Peter van Rosmalen, Maastricht University, Netherlands; **Co-Author:** Marco Kalz, University of Education Heidelberg, Germany

This workshop will illustrate how the scalability of the educational design of Massive Open Online Courses (MOOCs) can be analysed, using our design analysis instrument. The instrument is developed to get inspired by the current (best) practices in MOOC design. Participants will practice analyzing the educational design of MOOCs focusing among other things on constructive alignment between learning goals and learning activities, scalable formative feedback and assessment and student interaction using the design analysis instrument. Additionally, we will present case examples of current scalable best practices of MOOC design. The workshop is interesting for everyone who wants to learn more about scalable design, experienced as well as inexperienced.

Session U 12

16 August 2019 15:30 - 17:00

Seminar Room - S14

Workshop

Higher Education

Embedding employABILITY development across higher education

Keywords: Higher education, Metacognition, Student learning, Teaching approaches

Interest group: SIG 04 - Higher Education

Chairperson: Julien Mercier, University of Quebec in Montreal, Canada

The development of employability is a shared concern for teachers, students and institutional leaders. This workshop engages attendees in an approach with which employability can be embedded in the existing curriculum without extra time, resources or expertise. The approach positions employability development as the cognitive and social development of students as capable and informed individuals, professionals and social citizens. With a focus on ABILITY and equitable outcomes for all students, the workshop will engage participants in a personalised self-assessment profile and the resources and strategies with which to embed employABILITY thinking. Participants will then consider strategies for collaborative scholarship, research and teaching over the next 12 months, with the intention of reporting back at the following conference. The workshop will suit teachers, program leaders, curricular designers, senior managers and careers advisors. No prior expertise or experience of employability development or career development learning is required. For more information, please visit <http://developingemployability.edu.au/> or visit the student site at <https://student.developingemployability.edu.au/>

Embedding employABILITY development across higher education

Presenting Author: Dawn Bennett, Curtin University, Australia

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Session U 13

16 August 2019 15:30 - 17:00

Seminar Room - S01

Workshop

Learning and Social Interaction

Socio-Emotional and Material Learning (SEMLA) Activity-based workshop for early childhood education

Keywords: Collaborative Learning, Early childhood education, Interdisciplinary, Problem-based learning

Interest group: SIG 05 - Learning and Development in Early Childhood

Chairperson: Xavier Fontich, Autonomous University of Barcelona, Spain

The aim of this workshop is to provide an opportunity for participants to get involved in *Socio-Emotional and Material Learning (SEMLA)* and try out how various scaffolding strategies can be used in relation to individual children's learning as part of investigative and collaborative group-based learning. SEMLA draws from multiple theories of development and learning, educational philosophy, and operationalized in a set of didactic strategies. The concept of scaffolding in SEMLA is broadened and widened including teacher-child interactions as well as the educational environment and materials, digital aids such as tablets or computers and software. Further, there are also overarching issues and problems, which challenges and are sustained over time considered as scaffolding strategies. In this workshop we will investigate and problematize an important issue of concern; 'How to live and transport yourself in your neighbourhood in 100 years?' This question will be the starting point for an activity-based creative workshop in small groups, led by two teachers from Stockholm University. The participants will be invited to work cooperatively in small groups and construct innovative and creative buildings and other futuristic gadgets with a variety of materials, and at the same time they will let individual thoughts and solutions of problems be part of the process. Each participant in the group will get a specific task to focus on during the creative work, for example to scaffold the ongoing individual working processes. Concrete tools for observation, documentation and scaffolding will be provided. The workshop ends with a discussion.

Socio-Emotional and Material Learning (SEMLA) Activity-based workshop for early childhood education

Presenting Author: Anna Palmer, Stockholm University, Sweden; **Co-Author:** Teresa Elkin Postila, Stockholm University, Sweden

The aim of this workshop is to provide an opportunity for participants to get involved in *Socio-Emotional and Material Learning (SEMLA)* and try out how various scaffolding strategies can be used in relation to individual children's learning as part of investigative and collaborative group-based learning. SEMLA draws from multiple theories of development and learning, educational philosophy, and operationalized in a set of didactic strategies. The concept of scaffolding in SEMLA is broadened and widened including teacher-child interactions as well as the educational environment and materials, digital aids such as tablets or computers and software. Further, there are also overarching issues and problems, which challenges and are sustained over time considered as scaffolding strategies. In this workshop we will investigate and problematize an important issue of concern; 'How to live and transport yourself in your neighbourhood in 100 years?' This question will be the starting point for an activity-based creative workshop in small groups, led by two teachers from Stockholm University. The participants will be invited to work cooperatively in small groups and construct innovative and creative buildings and other futuristic gadgets with a variety of materials, and at the same time they will let individual thoughts and solutions of problems be part of the process. Each participant in the group will get a specific task to focus on during the creative work, for example to scaffold the ongoing individual working processes. Concrete tools for observation, documentation and scaffolding will be provided. The workshop ends with a discussion.

Session U 14

16 August 2019 15:30 - 17:00

Seminar Room - S02

Workshop

Teaching and Teacher Education

Enhancing a mastery-goal orientation in teacher education.

Keywords: Motivation, Pre-service teacher education, Teacher professional development, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Andrea Ximena Castano, Ecuador

Motivating students is a challenge for many teachers, preservice teachers in particular. How can teacher educators help their students –these preservice teachers- to become motivated themselves and learn the right strategies to motivate their own pupils? This is the main question for this workshop. The starting point for this workshop is the achievement goal theory, which describes motivation in terms of mastery and performance goals. Mastery goals focus on effort and understanding, whereas performance goals focus on competition and adhering to the norms. In the workshop, we want to introduce an instructional method focusing on the classroom goal structure needed to enhance mastery goals in the classroom. The workshop will concentrate on a) gaining more insight in achievement goals including personal and classroom goals, b) working with a systematic approach to enhance mastery goals, and c) exploring the possibility for incorporating this approach in teacher education curricula. With this workshop, we provide a professional development opportunity for teacher educators: they will gain more knowledge on the question of how to motivate their students. We add to the research into preservice teachers' motivation, and, we contribute to the limited research into the question if and how faculty can motivate their students. Finally, the workshop is also interesting to other teachers who are interested

in the question of how to enhance a mastery goal orientation in their own classrooms.

Enhancing a mastery-goal orientation in teacher education.

Presenting Author:Marjon Fokkens-Bruinsma, University of Groningen, Netherlands; **Co-Author:**Els van Rooij, University of Groningen, Netherlands; **Co-Author:**Esther Canrinus, University of Agder, Norway

Motivating students is a challenge for many teachers, preservice teachers in particular. How can teacher educators help their students –these preservice teachers- to become motivated themselves and learn the right strategies to motivate their own pupils? This is the main question for this workshop. The starting point for this workshop is the achievement goal theory, which describes motivation in terms of mastery and performance goals. Mastery goals focus on effort and understanding, whereas performance goals focus on competition and adhering to the norms. In the workshop, we want to introduce an instructional method focusing on the classroom goal structure needed to enhance mastery goals in the classroom. The workshop will concentrate on a) gaining more insight in achievement goals including personal and classroom goals, b) working with a systematic approach to enhance mastery goals, and c) exploring the possibility for incorporating this approach in teacher education curricula. With this workshop, we provide a professional development opportunity for teacher educators: they will gain more knowledge on the question of how to motivate their students. We add to the research into preservice teachers' motivation, and, we contribute to the limited research into the question if and how faculty can motivate their students. Finally, the workshop is also interesting to other teachers who are interested in the question of how to enhance a mastery goal orientation in their own classrooms.

Session U 15

16 August 2019 15:30 - 17:00

Seminar Room - S10

Workshop

Learning and Social Interaction

Social network analysis in educational research: when, why and how?

Keywords: Collaborative Learning, Cooperative/collaborative learning, Peer interaction, Quantitative methods

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Detlef Urhahne, University of Passau, Germany

Social network analysis becomes increasingly popular in educational research and more and more educational researchers are interested in designing a social network project. Therefore, in this workshop, we will cover the foundations of social network analysis. Participants will learn how they can set up a social network study: theoretical background of social networks, research questions at different levels, data collection and ethical concerns, metrics and analysis, and conclusions. They get an overview over the current (advanced) methods that are used in this field and what kind of questions they could explore. This workshop welcomes in particular researchers who are interested in starting social networks research or want to have more understanding of social network research. For more advanced participants, we provide an overview of advanced social network tools, such as stochastic actor based modelling. Overall, the workshop shows the necessary tools and ideas that allow participants to conceptualize and execute a social network study on their own. By practical assignments and in-depth discussions, we will help them in finding answers to the following questions: Why use social network analysis? What social network-research question to ask? How to get social network data? What are the options for analyzing social network data?

Social network analysis in educational research: when, why and how?

Presenting Author:Jasperina Brouwer, University of Groningen, Netherlands; **Co-Author:**Dominik E. Froehlich, University of Vienna, Austria

Social network analysis becomes increasingly popular in educational research and more and more educational researchers are interested in designing a social network project. Therefore, in this workshop, we will cover the foundations of social network analysis. Participants will learn how they can set up a social network study: theoretical background of social networks, research questions at different levels, data collection and ethical concerns, metrics and analysis, and conclusions. They get an overview over the current (advanced) methods that are used in this field and what kind of questions they could explore. This workshop welcomes in particular researchers who are interested in starting social networks research or want to have more understanding of social network research. For more advanced participants, we provide an overview of advanced social network tools, such as stochastic actor based modelling. Overall, the workshop shows the necessary tools and ideas that allow participants to conceptualize and execute a social network study on their own. By practical assignments and in-depth discussions, we will help them in finding answers to the following questions: Why use social network analysis? What social network-research question to ask? How to get social network data? What are the options for analyzing social network data?

Session U 16

16 August 2019 15:30 - 17:00

Seminar Room - S12

Workshop

Higher Education

Research Skills in Higher Education. A tool for iterative research in professional practices.

Keywords: Design based research, Higher education, Problem solving, Professions and applied sciences

Interest group: SIG 17 - Methods in Learning Research

Chairperson: Alberto Nagle Cajés, Uruguay

The purpose of research skills of many higher educated professionals, is to enable them to underpin actions and decisions in (daily) professional performance. Design based research offers a framework for research education with a vocational orientation, as it focuses on problem solving in a specific context. This raises the question how teachers in higher education can stimulate sound inquiry of their students, especially when research activities and professional action are intertwined. In response to this question we developed an interactive set of cards to support students in using suitable knowledge sources and methods for datacollection in a practice-based process. The underlying concept of the tool is a design model that connects research skills to concrete products and operational steps of action cycles in professional practice. Students from all domains can use the tool to visualize the iterative process of their quest for a solution in their professional context. Application of the tool in an institution wide interdisciplinary semester has generated feedback on the way students elaborate a solution for their problem definition. The workshop invites participants to use the cards for visualizing useful paths of research activities in their context. The results with the tool are a mediator for discussion about bottlenecks for practical relevance of students' research and for sharing ways to integrate design based research in education.

Research Skills in Higher Education. A tool for iterative research in professional practices.

Presenting Author:Miriam Losse, Saxion University of Applied Sciences, Netherlands; **Co-Author:**Koen Van Turnhout, Hogeschool van Arnhem en Nijmegen/HAN University, Netherlands

The purpose of research skills of many higher educated professionals, is to enable them to underpin actions and decisions in (daily) professional performance. Design based research offers a framework for research education with a vocational orientation, as it focuses on problem solving in a specific context. This raises the question how teachers in higher education can stimulate sound inquiry of their students, especially when research activities and professional action are intertwined. In response to this question we developed an interactive set of cards to support students in using suitable knowledge sources and methods for datacollection in a practice-based process. The underlying concept of the tool is a design model that connects research skills to concrete products and operational steps of action cycles in professional practice. Students from all domains can use the tool to visualize the iterative process of their quest for a solution in their professional context. Application of the tool in an institution wide interdisciplinary semester has generated feedback on the way students

elaborate a solution for their problem definition. The workshop invites participants to use the cards for visualizing useful paths of research activities in their context. The results with the tool are a mediator for discussion about bottlenecks for practical relevance of students' research and for sharing ways to integrate design based research in education.

Session U 17

16 August 2019 15:30 - 17:00
Seminar Room - S03
ICT Demonstration
Learning and Instructional Technology

Conceptualizing and Designing a Flipped Classroom in a Higher Education Large Statistics Lecture

Keywords: E-learning/ Online learning, Higher education, Instructional design, Mathematics

Interest group:

Chairperson: Ina Blau, Israel

Considering the challenges of manifold misconceptions, statistics anxiety and low cognitive activation in large statistics lectures in higher education, we would like to present the design and materials of a flipped classroom which we implemented in the context of a large field study with a treatment-control-design at two universities. The ICT materials we developed and used in the flipped classroom setting consist of well-received video tutorials, live voting, interactive demonstrations, electronic quizzes & final exams. In the ICT demonstration, we begin with a short introduction on the theoretical and practical significance of flipped classroom teaching in general and, in our specific case, in large statistics lectures. We will then introduce our diverse ICT material and explain how they relate to each other within our conceptual framework. We will allow participants to explore and interact with our concrete material. On that basis, we will discuss the concept as well as the material and hope to exchange good ideas and experiences with other participants who also work with blended learning designs or teach large lectures in statistics, mathematics or other topics.

Conceptualizing and Designing a Flipped Classroom in a Higher Education Large Statistics Lecture

Presenting Author: Andreas Maur, Johannes Gutenberg-Universitaet Mainz, Germany; **Presenting Author:** Kirsten Winkel, University of Mainz, Germany; **Co-Author:** Manuel Förster, Johannes Gutenberg University Mainz, Germany; **Co-Author:** Florian Heiss, Heinrich-Heine-University of Düsseldorf, Germany; **Co-Author:** Sigbert Klinke, Humboldt-University Berlin, Germany; **Co-Author:** Constantin Weiser, Johannes Gutenberg-Universitaet, Germany

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Session U 18

16 August 2019 15:30 - 17:00
Seminar Room - S05
Symposium
Instructional Design

Investigating and fostering historical learning activities at lower/upper secondary school levels

Keywords: Cognitive skills, Design based research, Experimental studies, History, Instructional design, Mixed-method research, Quasi-experimental research, Reading comprehension, Secondary education, Teaching/instruction, Writing/Literacy

Interest group: SIG 11 - Teaching and Teacher Education, SIG 20 - Inquiry Learning

Chairperson: Jannet van Drie, University of Amsterdam, Netherlands

Organiser: Martin Nitsche, Fachhochschule Nordwestschweiz, Switzerland

Organiser: Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland

Discussant: Holger Thünemann, University of Cologne, Germany

History educators seem to agree that history teaching should foster students' domain-specific competencies based on activities such as asking historical questions, analyzing sources and accounts or using disciplinary concepts that structure the discipline (e.g. significance). In the last three decades, several studies used material-based learning tasks to foster these aspects in students. However, a deeper understanding of students' domain-specific activities and powerful learning environments that support historical learning of pupils in divers learning contexts are needed. Our symposium aims to integrate these aspects by combining studies from three different countries (Netherland, Germany, Switzerland) that give insights into specific activities (e.g. asking questions) and investigate different aspects of historical thinking from a more holistic perspective. The first authors report effects of a quasi-experimental study with German students' that aimed to foster participants' skills of historical questioning in the context of essay writing. The second study highlights that structured scaffolds supported a group of students from German-speaking Switzerland to analyze historical images more deeply than another group who worked without it. The third investigation of Dutch school students' and experts' reading and writing activities indicate more historical reasoning activities and relatively less re-reading activities used by experts compared to the students. The last study highlights the effects of an intervention from German-speaking Switzerland that aimed to support students' narrative competence through reading and writing activities at upper secondary school level. Implications on our understanding of domain-specific activities and the construction of powerful learning environments in history classrooms shall be discussed.

Fostering students' skills to formulate authentic historical research questions

Presenting Author: Nicola Brauch, University of Bochum, Germany; **Co-Author:** Lena Beherendt, University of Bochum, Germany

In a quasi-experimental study implemented in an Out-of-school lab we investigated effects of two treatments to foster students' historical questioning and reasoning skills (N = 116 students of upper secondary school tracks). Two different method trainings were carried out: In a first condition (N = 62) students were given a *basic training* on asking historical research questions (10 minutes), while in a second condition (N = 54) students were given *extended training* with scaffolding-elements (20 minutes). After the method training students were asked to formulate their own historical research questions based on a sample of multiple authentic historical documents and develop an inquiry. At the end of the one day-project students wrote proposals on their research questions. Interest and self-perceived competence as sub-dimensions of students' motivation during these activities were examined. No significant differences between the conditions were found. In order to analyse students' proposals a scoring rubric consisting of 16 categories was developed. Students in both conditions were able to master the demanding task to write a scientific proposal. Findings suggest that students in the *extended training*-condition scored significantly higher on *question focused historical reasoning*, but significantly lower on *generic scientific writing* in their proposals.

Fostering visual literacy in secondary school: Critical reasoning about historical images

Presenting Author: Kevin van Loon, PH FHNW, Switzerland; **Co-Author:** Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland

Although an important aim of history education is to train critical reasoning competences, students often have difficulties with this. When interpreting texts, document-based writing activities seem to be helpful. However, even though images are often used, and critical interpretation of images seems more and more

important in the current digital age, it is unclear how students can be supported to critically reflect on the content, context and the underlying intentions of its producers. This study aimed to investigate whether and how secondary school students (eight grade) interpret images. They were asked to complete a document-based writing task about the images. Students collaborated in small groups. Half of it worked with a rubric indicating central aspects of image interpretation (e.g. content, pictorial elements, perspective, context). Group discussions were videotaped. All images were discussed in depth, and all students searched for further information. The two groups who had access to the rubric used it as a checklist. Their discussions were more structured than those of the two groups without rubrics. In all groups, students understood principles of controversy. However, they had difficulties understanding underlying intentions, and they paid little attention to symbolic meaning of pictorial elements, to the relevance of sources, and to trustworthiness. The findings allow us to understand students' issues when interpreting historical images. Presumably, students need additional interpretation resources when working with images. Describing, analysing and interpreting images in a circular manner supported by a rubric may enhance critical reflection.

Writing about Historical Significance: Differences between Novices and Experts

Presenting Author:Johan van Driel, University of Amsterdam, Netherlands; **Presenting Author:**Jannet van Drie, University of Amsterdam, Netherlands; **Co-Author:**Carla Van Boxtel, University of Amsterdam, Netherlands

The aim of this study is to investigate difficulties 10th grade students encounter when reading, reasoning and writing about historical significance. We conducted a think-aloud study in which 12 students (divided into low, average and high performing students) and four experts participated. They read two historical accounts and wrote a letter about the historical significance of Columbus. Think-aloud protocols were analyzed on reading, writing and historical reasoning activities. Results showed that experts, compared to students, conducted relatively less reading activities (especially re-reading activities) and more historical reasoning activities. They paid substantial more attention to contextualization, sourcing and text-planning activities. Contrary, low performing students showed more reading and less historical reasoning activities. In conclusion, students were struggling with domain-specific reading and writing. These outcomes provide directions for teaching writing about historical significance.

Fostering historical writing in upper secondary schools: Results of an intervention study

Presenting Author:Martin Nitsche, Fachhochschule Nordwestschweiz, Switzerland; **Co-Author:**Monika Waldis, University of Applied Sciences Northwestern Switzerland, Switzerland; **Co-Author:**Kristine Gollin, University of Applied Sciences Northwestern Switzerland, Switzerland

History educators highlight the significance of historical writing to support students' historical learning. Several German-speaking scholars conceptualize the skills people need to write histories as narrative competence. So far, few experimental studies with limited numbers of test persons have been conducted in the German-speaking area whereas empirical findings on the notion of argumentative writing in the Anglo-Saxon tradition show that historical reasoning and writing skills can be supported by writing instruction and writing tasks. Based on this preliminary work, we developed a writing intervention for upper secondary school students in German-speaking Switzerland that aimed to support participants' narrative competence. Working with an experimental/control group and a pre-/post-test study design, we assessed students' narrative competence with material-based writing tasks and participants' competence of historical thinking with a closed-ended-item test. Moreover, the students answered questionnaires assessing their epistemological beliefs and their writing self-efficacy beliefs. The empirical findings indicate effects of the writing intervention on students' development of competences of historical thinking in the experimental group. No significant effects were found for the beliefs scales. Currently, 722 student texts originating from the material-based writing tasks (pre-/post) are analyzed. It is hypothesized that text quality of the student texts will be raised in the experimental group through the means of the conducted writing intervention. We will discuss the significance of the study results for history education in upper secondary schools and will point out some limitations based on the study design and the assessment tools.

Session V 1

16 August 2019 17:15 - 18:45

Lecture Hall - H11

SIG Invited Symposium

Learning and Instructional Technology

SIG 27:New Approaches, Old Issues–New Methodologies Cast New Light Upon Known Educational Concepts

Keywords: Case studies, Computer-assisted learning, Cooperative/collaborative learning, Educational technology, Experimental studies, Learning Technologies, Mixed-method research, Problem solving, Quantitative methods, Technology

Interest group: SIG 27 - Online Measures of Learning Processes

Chairperson: Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

Organiser: Halszka Maria Jarodzka, Open University of the Netherlands, Netherlands

Discussant: Ellen Kok, Utrecht University, Netherlands

Important advances in research sometimes stem from discovering new topics. Other times, they arise when looking at well-established topics from a different perspective. This is the focus of our invited symposium. We present four well-established research topics from Educational Science, namely, teaching to read, solving math problems in collaboration, searching for information on the internet, and measuring cognitive load. Even though you can find plenty of research on each of these topics, we show how recent projects shed entirely new light on these topics with their new – sometimes unconventional – approaches. Špakov, Istance et al. innovate teaching to read with gaze-based reading aids for students implemented with low-cost eye trackers in real classrooms. Hannula investigated collaborative math problem solving of students supported by their teachers with the help of self-made eye tracking hardware and self-developed innovative software. Kammerer brings the research of learning through internet-search closer to educational practice by studying free search with unrestricted access to real internet documents. Krejtz combines fixations and saccades with microsaccades to measure cognitive load, which allows using this method for the first time in free-viewing tasks. In line with the topic of this symposium, we take a new approach to discuss these contributions: we include the entire audience as discussants via digital technology to discuss the current relevance of these established topics to educational research and practice, the feasibility of these new approaches to research or practice, and other well-established topics that should be revisited from a fresh point of view.

Using eye tracking to assist teaching reading in schools

Presenting Author:Howell Istance, Tampere University, Finland; **Co-Author:**Oleg Spakov, Tampere University, Finland; **Co-Author:**Harri Siirtola, Tampere University, Finland; **Co-Author:**Kari-Jouko Rähkä, Tampere University, Finland; **Co-Author:**Hanna-Maija Sinkkonen, University of Turku, Finland; **Co-Author:**Anne Hällfors, Sibelius Upper Secondary School, Finland

As eye tracking technology becomes cheaper and more accessible, the opportunities for integrating this into educational systems increase. One application area is the teaching of reading skills to pupils and students of different ages. If the reader's gaze position is tracked during reading, this can be used to provide automatic assistance to the reader if reading difficulties can be reliably detected. This may be useful during reading classes where the teacher's ability to assist individual students is limited. The data collected from gaze-enabled reading aids being used by several students at the same time can be shared with the teacher. The gaze behaviour in the relation to the text being read needs to be summarised and visualised in a way meaningful to the teacher. This can allow the teacher to examine reading performance of individuals either in close to real time or after the lesson. It can allow the performance of several students reading the same passage to be compared. It can help when making periodic assessments of performance of students in a class. The gaze-enabled reading aid may be used in different teaching situations: early reading of L1 languages; facilitating comprehension of L1 languages; and learning to read L2 languages. Another application is the support of special needs reading teachers, where the gaze-enabled reading aid can be both a diagnostic tool, and a tool to support the teacher in devising and monitoring strategies for individual students to overcome reading difficulties.

Multiple person mobile eye tracking in natural environments: Heatmaps and gaze synchrony graphs

Presenting Author:Markku Hannula, University of Helsinki, Finland

Eye-tracking is a method to get information on student cognition as it happens. Mobile eye-tracking allows us to address new questions. However, affordances

and limitations of mobile eye-trackers require that we reconsidered the research methodology. In our MathTrack project we study eye movements in the context of collaborative problem solving. In each class, we have collected eye tracking data from the teacher and four collaborating students. We face two methodological challenges. First, researchers have only a limited control to what happens in the class, and gaze targets appear, move, and disappear in unexpected manner. Our solution to this has been the use of visual markers in the classroom, which can be used to automatically compute heat maps. Second, to study the collaboration of multiple persons, we need to find ways to measure gaze behaviour on a group level. We have developed a solution that provides a measure of gaze synchrony as a function of time and we can even compute statistical significance for the level of synchrony. In addition to presenting an overview of our methodological solutions, I share selected research findings.

Predicting knowledge gain during multimodal Web search by means of query and navigation logs

Presenting Author:Yvonne Kammerer, Knowledge Media Research Center, Germany

The Web has become a major knowledge resource to learn about complex scientific concepts, providing easy access to vast amounts of information in various representation formats (e.g., text, pictures, and videos). Previous studies that have examined how individuals search on the Web to learn about science-related issues have mainly used pre-selected document sets with only textual content. In contrast, the goal of the present research is to examine how individuals search the Web to learn about a complex scientific issue (i.e., the formation of thunderstorms and lightning) in a more naturalistic setting, that is, when searching on the open Web that provides a multitude of text-based and multimodal materials. Specifically, we aim at identifying query and navigation patterns that are positive predictors of individuals' knowledge gain. In the presentation, an overview of the methodology and the results of this research will be provided and the added value as well as limitations of such naturalistic Web search studies will be discussed.

Cognitive Load Eye Tracked. Microsaccadic and Pupillary Responses to Task Difficulty

Presenting Author:Krzysztof Krejtz, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Andrew T. Duchowski, Clemson University, United States; **Co-Author:**Izabela Krejtz, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Justyna Żurawska, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Anna Niedzielska, SWPS University of Social Sciences and Humanities, Poland; **Co-Author:**Cezary Biele, Information Processing Institute, Poland; **Co-Author:**Donald House, Clemson University, United States

Reliable and accurate, non-subjective measure of cognitive load is of a high interest in many educational settings. Recent advances in the eye tracking measurement technology, especially in capturing involuntary micro eye movements and pupil oscillations, is building high expectations in this manner. However, direct comparison of reliability and sensitivity of task- evoked pupillary and microsaccadic measures of cognitive load is insufficiently present in the literature. The talk summarizes the results of two empirical studies. In the first one participants performed easy and difficult mental arithmetic tasks while keeping the eyes fixed. Inter-trial change in pupil diameter and microsaccade magnitude appear to adequately discriminate task difficulty, and hence cognitive load, if the implied causality can be assumed. In the second study the task difficulty was manipulated with visual stimuli perceptual features (a terrain-like surface) while performing visual search task with eyesmoving freely. We propose a novel approach of combining big eye movements (fixations and saccades) with microsaccades. We use ambient/focal segments based on Krejtz's Kcoefficient as a moderating factor for microsaccade analysis in response to task difficulty. The results revealed that during the focal phase of visual search microsaccade magnitude increases and microsaccade rate decreases with increased task difficulty. We conclude that the combined use of K and microsaccade analysis may be helpful in building effective tools that provide an indication of the level of cognitive activity within a task when eyes may move freely.

Session V 2

16 August 2019 17:15 - 18:45

Lecture Hall - H06 - Amazon Hörsaal

Symposium

Assessment and Evaluation, Instructional Design

Conceptualizing, assessing, explaining and fostering scientific reasoning skills

Keywords: Argumentation, Assessment methods and tools, Cognitive skills, Cooperative/collaborative learning, Higher education, Instructional design, Primary education, Psychometrics, Quasi-experimental research, Reasoning, Science education, Secondary education, Social sciences

Interest group: SIG 01 - Assessment and Evaluation, SIG 05 - Learning and Development in Early Childhood, SIG 06 - Instructional Design, SIG 26 - Argumentation, Dialogue and Reasoning

Chairperson: Jan Elen, KU LEUVEN, Belgium

Organiser: Louise Maddens, KU LEUVEN, Belgium

Discussant: Tina Seufert, Ulm University, Germany

As reflected in international curriculum and policy documents, acquiring scientific reasoning skills is an important goal of education. Consequently, in recent years, there has been an increasing interest in the question how to conceptualize, to assess and to foster students' scientific reasoning skills. Hence, this symposium unites four researchers working on these topics. The first contributor (concerned with the problem of the conceptualization of scientific reasoning skills) elaborates on a theoretical framework conceptualizing scientific reasoning skills in terms of three epistemic modes, and eight epistemic activities (Fischer et al., 2014), and identifies relevant research areas to further our conceptual understanding of scientific reasoning skills. In the second contribution of this symposium, the issue of the assessment of scientific reasoning skills is addressed. Although to date several tests have been developed, their conceptual base and the skills they address differ widely. As such, in the second presentation, the development process, administration and analysis of a new instrument (LRST; a test aiming to assess students' research skills proficiency in upper secondary education) is clarified. The third contributor of this symposium discusses the role of reading comprehension, arithmetic ability and problem solving skill in explaining variation in scientific reasoning. In the fourth talk, the effect of interactive and constructive instructional approaches on students' proficiency in evaluating scientific literature is addressed. An expert in the measurement of hard-to-measure concepts (such as cognitive capacity and cognitive load) will lead the symposium as a discussant. During (and after) the symposium there will be room for discussion.

Scientific Reasoning and Argumentation as Engagement in Epistemic Activities

Presenting Author:Christopher Osterhaus, Ludwig-Maximilians-Universität, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Scientific reasoning and argumentation (SRA) entail—broadly defined—the process of intentional knowledge seeking (Kuhn, 2002). Departing from a normative perspective on how justified knowledge should be constructed, most psychological writing has described SRA as a guided search and information-gathering activity. This paper presents a nonnormative framework that conceptualizes SRA in terms of three epistemic modes (EMs) and eight epistemic activities (EAs) (EM-EA framework; Fischer et al., 2014). Reviewing the empirical work that has been inspired by this framework, we identify relevant areas for further conceptual development in the EM-EA framework. Specifically, we suggest that the demarcation between knowing-oriented activities that are genuinely epistemic and those that are nonepistemic needs to be addressed, and that the interdependency between different EAs needs to be revisited (i.e., when does evidence generation build on a prior hypothesis? When do hypotheses follow from evidence generation?). Solving these conceptual issues will substantially improve the EM-EA framework, which has proven to be a valuable tool in promoting research on scientific reasoning and argumentation across several domains.

Evaluating the Leuven Research Skills Test

Presenting Author:Louise Maddens, KU Leuven, Belgium; **Co-Author:**Fien Depaep, KU Leuven, Belgium; **Co-Author:**Rianne Janssen, KU LEUVEN, Belgium; **Co-Author:**Annelies Raes, KU Leuven, Belgium; **Co-Author:**Jan Elen, KU Leuven, Belgium

As reflected in (international) curriculum documents, 21st century education aims at empowering students to acquire a broad set of skills that enables them to

use scientific methods and concepts to identify and to solve (research, work and daily life-related) problems (Fischer et al., 2014; Opitz, Heene & Fischer, 2017). In this contribution, these skills are referred to as research skills. However, to date, no test exists to assess students' research skills in a behavioral sciences classroom context. In addition, a conclusive description of the dimensional structure of research skills is lacking. Therefore, a new test was constructed consisting of items related to eight epistemic activities, hereby relying on the theoretical framework of Fischer et al. (2014) as a conceptual basis for item construction. In this contribution, the development, testing and evaluation process of this Leuven Research Skills Test is described, based on an administration to 405 Belgian 11th and 12th grade students. More particularly, the psychometric properties and the dimensional structure of the LRST are investigated. The results reveal that (1) the LRST is an internal consistent instrument and that (2) a hierarchical model with eight subordinate factors and one single uniting upper level factor appears to be the best fit to the data (in comparison with a unidimensional model, and an eight-factor multidimensional model). As such, it is argued that the LRST can be used to assess (individual differences in) overall research skills proficiency and to investigate the effect of particular interventions to foster research skills in future studies.

Unraveling scientific reasoning: explaining children's performance in constituent skills.

Presenting Author:Erika Schlatter, Radboud University, Netherlands; **Co-Author:**Ard Lazonder, Radboud University, Netherlands; **Co-Author:**Inge Molenaar, Radboud University Nijmegen, Netherlands; **Co-Author:**Noortje Janssen, Radboud University, Netherlands

Scientific reasoning is an important domain-general skill comprised of various rather diverse subskills such as hypothesizing, experimenting and evaluating evidence. Previous studies have found consistent differences in the extent to which children master these skills, but what underlies these differences is less well established. This study examined the role of three predictors (reading comprehension, arithmetic ability and problem solving skill) in explaining variation in scientific reasoning as a whole and at the subskill level. To this end 166 upper elementary school children completed a performance-based scientific reasoning test that distinguished between hypothesizing, experimenting, inferring, evaluating data and drawing conclusions. Children took standardized tests for reading comprehension and arithmetic ability and performed a short computerized Tower of Hanoi task that tapped their problem solving skills. Of these predictor variables, only reading comprehension explained variation in scientific reasoning as a whole. Reading comprehension also explained variation in the subskills of experimenting and evaluating data, but not in the other subskills. This shows that even though reading comprehension is considered a robust predictor of scientific reasoning, it cannot be used to predict variation in all constituent skills. Future research should scrutinize the differences between subskills as well as students.

Reading scientific articles: facilitating evaluation of structured briefs of scientific literature

Presenting Author:Katharina Engelmann, Technical University of Munich (TUM), Germany; **Co-Author:**Andreas Hetmanek, Technical University of Munich (TUM), Germany; **Co-Author:**Birgit J. Neuhaus, LMU Munich, Germany; **Co-Author:**Frank Fischer, Ludwig-Maximilians-Universität (LMU), Germany

Evidence-based practice in the education field becomes a more and more relevant topic, particularly for practitioners outside of academia. One possible approach in supporting students to evaluate scientific literature adequately are interventions with interactive learning activities. This study examines the effect of constructive and interactive approaches in interventions. In an experimental between-subjects design, 105 students learned about criteria to evaluate scientific literature in an online learning environment for 50 minutes. The results show that the evaluation of scientific literature can be advanced by an intervention. However, the hypothesis that interactive learning activities facilitate these skills more successfully than constructive learning activities can not be supported based on the findings in this study.

Session V 3

16 August 2019 17:15 - 18:45

Lecture Hall - H07

Symposium

Design research for teaching the ability to analyse in social science education

Keywords: Assessment methods and tools, Design based research, Phenomenography, Primary education, Reasoning, Secondary education, Social sciences

Interest group:

Chairperson: Malin Tväråna, Stockholm University, Sweden

Organiser: Cecilia Lundholm, Stockholm University, Sweden

Discussant: Alexandra List, United States

A key aspect of learning in social science is the ability to analyse. However, research in this area is scarce and there are few studies investigating how instruction may support the development of this ability. In this symposium four studies investigating the ability to analyse in social studies and civics education are presented. The studies explore what it means to be able to analyse different social issues, how this is related to students' conceptions and learning of subject content, and how design principles for teaching, and assessment tasks, can be developed to enhance this ability. The papers focus on analytical concepts such as 'cause and consequence' relating to for example migration, as well as other areas and core concepts such as 'value' in economics and 'justice'. All of the studies use design research and were conducted in collaboration with teachers in primary, secondary and upper secondary education.

Authentic assessment of students' reasoning about social problems

Presenting Author:Carla Van Boxtel, University of Amsterdam, Netherlands; **Co-Author:**Anne Hemker, Cito Arnhem, Netherlands; **Co-Author:**Thomas Klijnstra, University of Amsterdam, Netherlands; **Co-Author:**Gerard Ruijs, University of Amsterdam, Netherlands

Social science education can fulfil a crucial role by engaging students in explanatory discourse and equipping them with knowledge about political and social aspects of social problems and disciplinary reasoning competences. One of the challenges for social science teachers in secondary education is the assessment of complex reasoning competences, such as reasoning about causes, consequences and solutions of social problems. Authentic assessment tasks have been advocated because they involve students deeply in terms of cognitive complexity and intrinsic interest. However, the literature provides little guidance for the design of authentic assessment tasks and a clear operationalization of the ability to reason causally about social problems is lacking. In this design research we developed a framework for causal reasoning about social problems and design principles for authentic assessment tasks. Eight social science teachers used the framework and the principles to develop authentic assessment tasks and implemented these tasks in their classroom. We used a mixed method design to evaluate the assessment tasks and the underlying principles. Our analysis of the tasks and of the student papers (N = 388) showed that the framework and the design principles were useful to design assessment tasks that elicited the demonstration of causal reasoning. The tasks elicited the identification of causes, consequences and solutions, but to a lesser extent supporting assertions with evidence. Results of a student questionnaire and interviews showed that students were neutral to positive about the authentic character of the task, but in some cases critical about the clarity.

Qualitative differences in the ability to analyse – the example of the Mediterranean refugee crisis

Presenting Author:Ann-Sofie Jägerskog, Stockholm University, Sweden; **Co-Author:**Malin Tväråna, Stockholm University, Sweden; **Co-Author:**Max Strandberg, Stockholm University, Sweden; **Co-Author:**Mattias Björklund, Stockholm University, Sweden; **Co-Author:**Bodil Kåks, City of Stockholm, Sweden; **Co-Author:**Anita Dalman, Värmdö municipality, Sweden

This study contributes to the understanding of what it means to be able to analyse societal issues in Social Studies education, an ability considered central in both compulsory and upper secondary education, but not thoroughly explored in previous research (Barton & Avery, 2016). Providing a richer understanding of this ability is crucial in order to design teaching that effectively enables students in different age groups to develop this ability. The study focuses on students' analysis of the 2015 Mediterranean refugee crisis and was carried out as a learning study with iteratively conducted research lessons in four classes in year 1, 6 and 8 (compulsory education) and year 2 in upper secondary education. The data, consisting of written student responses to open-ended questions and recorded group discussions, was analysed using phenomenographic methods (Marton, 2015). Five qualitatively different ways of analysing the migration crisis were identified, where students to various extent expressed an understanding of the complexity concerning causation and the importance of taking different

dimensions into consideration. Also, three critical aspects were identified as necessary for students to discern in order to develop more qualified ways of analysing the societal issue in focus. Results suggest that the most qualified way of analysing the migration situation was characterised by seeing the Mediterranean refugee crisis as a dynamic process, where a consequence can also be a cause and where different dimensions are related. The study contributes with important implications for teaching Social Studies as well as to theory concerning the ability to analyse.

What's the value of water? Developing the ability to analyse economic issues in social studies

Presenting Author: Mattias Björklund, Stockholm University, Sweden; **Co-Author:** Malin Tväråna, Stockholm University, Sweden; **Co-Author:** Ann-Sofie Jägerskog, Stockholm University, Sweden; **Co-Author:** Max Strandberg, Stockholm University, Sweden; **Co-Author:** Eva Malmqvist, City of Stockholm, Sweden; **Co-Author:** Jan Norevik, Ekerö municipality, Sweden; **Co-Author:** Lena Olin, Ekerö municipality, Sweden; **Co-Author:** Linda Karlander, Ekerö municipality, Sweden

The study addresses the questions of how different teaching designs relate to how students in year 1, 4, 5 and 8 (compulsory education) understand and learn the concept of economic value. Economics has been a growing area within the Swedish Social Studies subject, creating new challenges for teachers when integrating this content area as citizenship education. This study investigates how a teaching design makes different economic and financial matters visible to learners in different age groups and was carried out through a learning study. Data consisted of recorded group discussions among students, as well as written student answers to open response pre- and post-test questions, which were analysed using phenomenography (Marton, 2015). Results show three structural aspects necessary for students to discern in learning about economic value; that economic value (1) is constructed rather than essential, (2) emerges in relation to a lack of resources, and (3) is a relation in a system of different kinds of resources. Age does not seem to be a pivotal factor for learning or understanding price and value. By shifting focus from supply to demand with the instructional examples, learners' life world came closer to the desired learning object - that value and price are constructed and emerge as a relationship between supply and demand in a wide system of resources.

Theories of justice in primary school: Developing students' critical analyses in social studies

Presenting Author: Malin Tväråna, Stockholm University, Sweden

Critical thinking about key concepts in social studies and civics has long been recognized as crucial for social studies education, but there is less agreement on when and how it is meaningful to introduce them. This study addresses the question of what conditions of teaching that are necessary and beneficial for the development of the ability to analyse justice issues in early social studies and civics education. In an interventional study with 30 participating students in primary education, teaching was designed and analysed in collaboration with two class teachers. According to phenomenography, the ability and incentive someone has to act in a certain way is related to the way in which they experience a certain phenomenon (Marton & Booth, 1997). The teaching design relied on a previous study showing that in order to reason critically about justice issues, older students need to grasp the concept of justice not as a stated or explained fact or viewpoint but as a contested concept that needs critical examination. Phenomenography and variation theory were used for the analysis, and the results show that it is possible for eight-year-olds to start learning how to reason about justice as an essentially contested concept and to start participating in critical analyses of distributive justice issues in a qualified way. It is thus worth considering introducing critical thinking and the concept of justice early in social studies education.

Session V 4

16 August 2019 17:15 - 18:45

Lecture Hall - H05

Symposium

Motivational, Social and Affective Processes

Emotion-eliciting events in teacher-student interactions

Keywords: Emotion and affect, Social aspects of learning and teaching, Teacher professional development, Teaching/instruction

Interest group: SIG 08 - Motivation and Emotion

Chairperson: Astrid Poorthuis, Utrecht University, Netherlands

Chairperson: Helma Koomen, Research Institute of Child Development and Education, Netherlands

Discussant: Anne Christiane Frenzel, University of Munich, Germany

Teacher-student interaction is one of the most proximal factors affecting teacher emotional processes and wellbeing. To date, this topic has been studied mainly on an aggregated level. This symposium aims to learn more about specific events and corresponding emotions that are important in teaching.

Using a daily diary approach, the first paper investigated the extent to which work-related events, reported by teachers, were specifically related to teacher-student interaction and the impact of events on teachers' daily positive and negative affect. The second paper innovatively identified emotionally inducing events through heart-rate and linked moments of high heart-rate to interpersonal behavior during teaching. In the last two papers, events and emotions are studied in the context of teachers' more general views about students. The third paper examined how general views of teachers about students' problem behaviors impact the emotional processes in response to classroom events. The last paper investigated a way of changing troublesome teacher-student interactions by coaching teachers to reflect on specific events and associated emotions concerning a target student.

This symposium shows the importance of investigating specific emotion-eliciting events during teaching to gain insight in the emotional life of teachers. The studies helps us to identify events that elicit negative emotions, but also those that elicit positive emotions, thus providing insight in how teacher wellbeing can be supported. The symposium will provide ample possibilities for the audience to interact: after each presentation, in response to issues raised by the discussant (a leading scholar) and in open discussion at the end.

The Role of Teacher-Student Interactions for Beginning Teachers' Emotions: Results of a Diary Study

Presenting Author: Karen Aldrup, Leibniz Institute for Science and Mathematics Education, Germany; **Co-Author:** Uta Klusmann, Leibniz Institute for Science and Mathematics Education (IPN), Germany

The transition from university into practice is an important but often challenging phase in teachers' professional lives. In particular, student misbehavior is a central stressor that has been consistently linked to negative emotions and reduced well-being. However, prior research has rarely considered the broad variety of interactions taking place between teachers and students on a daily basis, which may be a source of anger or frustration but also of enjoyment. Therefore, we conducted a two-week online diary study with 142 beginning teachers of all school types who reported daily on their positive and negative work-related events in an open format and rated their positive and negative affect at the end of each work day. Two independent raters categorized the events based on a theoretically founded coding scheme. Results showed, first, that about 50% of teachers' daily work-related events referred to teacher-student interactions—mostly to student motivation (i.e., engagement vs. lacking concentration or refusal of work). Second, using multilevel modeling, we found that positive teacher-student interactions, in particular the ones outside class such as school trips or extracurricular activities, were associated with teachers' daily positive affect. Moreover, negative interactions, in particular those referring to students' social-emotional difficulties such as disciplinary issues or peer conflicts, were related to daily negative affect. Our findings underpin the importance of teacher-student interactions for teachers' emotional lives and show that research and teacher education should consider the diverse nature of these interactions rather than focusing only on content-specific aspects.

Teachers' Emotions And Wellbeing: The Interpersonal Nature and Relevance of High Heart Rate Events

Presenting Author: Monika Donker, Utrecht University, Netherlands; **Co-Author:** Mariska van den Hove, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Tim Mainhard, Utrecht University, Netherlands

Interacting with students is an integral part of teaching, and teachers experience this simultaneously as a blessing and a curse. Although there have been many studies into teacher-student interaction and their effect on teacher outcomes, there is lack of knowledge about specific events during the lesson and their potential relevance for teachers' general emotions and wellbeing. The present study explored the use of heart rate to pinpoint possible emotionally relevant

interpersonal events during real-life classroom interaction. Lessons of 80 teachers in secondary education were videotaped while the teachers' heart rate was measured. Based on the video recording, both teacher's and students' interpersonal behavior in terms of Agency (dominance) and Communion (friendliness) was scored continuously. Results showed that teachers had on average more Agency and more Communion than their students during events where teachers had a higher heart rate, but there were large inter-individual differences. Furthermore, teachers reported more positive emotional outcomes when the difference between teacher and student Agency during high heart rate events was larger, but more negative emotions when the Communion differences were larger during these events. These findings underscore the potential of heart rate to get insight into relevant events during real-life teaching, and could be used to both specify research findings and improve teacher-student interaction.

Teachers' Appraisals and Emotions in Daily Events with Students Varying in Externalizing Behavior

Presenting Author:Janneke de Ruyter, University of Amsterdam, Netherlands; **Co-Author:**Astrid Poorthuis, Utrecht University, Netherlands; **Co-Author:**Helma Koomen, Research Institute of Child Development and Education, Netherlands

Teaching is an emotional practice, in particular when interacting with students. This study tested the proposition that teachers' general view of a student's behavior may impact the emotional reactions to interactions with that student. Using a diary approach, this study examined whether teachers' emotions during classroom events with individual students were predicted by teachers' appraisals of those events and whether teachers' perception of the student's general externalizing behavior added to this prediction. Furthermore, the moderating role of externalizing behavior on the association between appraisals and emotions was examined. Primary school teachers (grade 3-6, $N = 36$) completed up to 30 daily diaries ($N = 970$) across the school year describing classroom events with two target students who differed in externalizing behavior and reported on associated appraisals (valence and coping potential) and emotions (enjoyment, anger, anxiety, self-related, and other-related). They also reported on each target student's general externalizing behavior. Multilevel analyses showed that teachers' appraisals of the event predicted all emotions. With students they perceived as relatively high on general externalizing behavior, teachers experienced less enjoyment and other-related emotions (e.g., caring) and more anger and anxiety during classroom events. Moderation effects were also found, indicating that relations between appraisals and emotions were stronger for classroom events that involved students higher on externalizing behavior. These findings imply that teachers' emotions during daily events do not only depend on teachers' appraisals of the event, but also on teachers' more general views about the problem behavior of the student involved.

Reflection on Specific Events: A Multiple Case Intervention Study With Teachers in Special Education

Presenting Author:Tessa Weyns, KU Leuven, Belgium; **Co-Author:**Anne-Katrien Koenen, KU Leuven, Belgium; **Co-Author:**Annet de Vroey, KU LEUVEN, Belgium; **Co-Author:**Geert Kelchtermans, Katholieke Universiteit Leuven, Belgium; **Co-Author:**Jantine Spilt, KU Leuven, Belgium

Students with special needs are often emotionally challenging for teachers and may negatively impact teachers' emotions and wellbeing. In particular, beginning teachers may struggle with negative emotions. This multiple case intervention study examines Relationship-Focused Reflection. Relationship-Focused Reflection uses in-depth interview techniques to stimulate reflective processes in teachers. The intervention aims to foster teachers' awareness of their (negative) implicit emotions and cognitions in order to increase teachers' insight in relational processes and to make teachers feel more effective in relationship building (with emotionally-challenging students). Participants were six pre-service teachers in their final internship in special education primary schools. An emotion diary during 11 weeks (e.g. joy, helplessness) was administered. In the middle of the internship, the intervention was administered. Visual between- and within-phases analyses revealed differential intervention effects across teachers.

Session V 5

16 August 2019 17:15 - 18:45

Lecture Hall - H08

Symposium

Learning and Social Interaction

Teacher-child interaction in pre-school and its effects on children's learning

Keywords: Early childhood education, Mathematics, Motivation, Science education, Social interaction, Student learning, Teacher Effectiveness, Video analysis

Interest group:

Chairperson: Andrea Wullschleger, University of Zurich, Switzerland

Discussant: Miriam Leuchter, University of Koblenz - Landau, Germany

High-quality teacher-child interaction, understood as instructional support, emotional support, and classroom organisation (Suchodoletz et al., 2014), is a crucial factor in effective teaching practice, and especially important concerning young children's cognitive and social development (Krammer, 2017). As young children learn rather implicitly and incidentally, learning in pre-school settings takes place preferably informally and is implemented in everyday situations. These settings are suitable for implementing high-quality teacher-child interactions. So far, little research has been carried out into investigating the characteristics of effective interactions in pre-school. This symposium aims to contribute to this research field by analysing the effects of different aspects of teacher-child interactions and its quality on children's learning by taking into account several contexts, such as science, mathematics and language. Pohle et al. investigate the quality of instructional support and its effects on children's mathematical learning. Wullschleger et al. have the same subject focus but research all aspects of teacher-child interaction. Bürgermeister et al. examine instructional support during early science instruction while Salminen et al. analyse pre-mathematical skills, pre-reading skills, vocabulary and motivation with respect to all aspects of teacher-child interaction.

Krammer, K. (2017). Die Bedeutung der Lernbegleitung im Kindergarten. Wie können frühe mathematische Lernprozesse unterstützt werden? In S. Schuler, C. Streit & G. Wittmann (Hrsg.), *Perspektiven mathematischer Bildung* (S. 107–123). Wiesbaden: Springer Spektrum. von Suchodoletz, A., Fäsche, A., Gunzenhauser, C. & Hamre, B. K. (2014). A typical morning in preschool: Observations of teacher-child interactions in German preschools. *Early Childhood Research Quarterly*, 29, 509–519.

Effective Teaching Practices and Children's Learning Growth in Early Mathematics Education

Presenting Author:Lara Pohle, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Lars Jenßen, Freie Universität Berlin, Germany; **Co-Author:**Georg Hosoya, Freie Universität Berlin, Germany; **Co-Author:**Katja Eilerts, Humboldt-Universität zu Berlin, Germany; **Co-Author:**Sigrd Blömeke, University of Oslo, Norway

This study focuses on the relationship between preschool teachers' stimulation quality and children's learning growth in the domain of "counting, magnitudes and numbers". Preschool teachers' performance was assessed using indicators of a standardized observation tool to capture the teachers' domain-specific stimulation quality (MiA-num: Pohle et al., submitted). Additionally, children's basic numerical competences were tested twice within the period of seven months using a standardized test (MBK-0: Seeger et al., 2014). The sample consisted of 25 preschool teachers working in Berlin and Brandenburg and 202 children who were tested twice within the period of seven months. Multilevel analysis was done with respect to clustered data. Results show a tendency towards the importance of teaching practices when considering children's learning growth as a criterion.

Pre-school teachers' learning support and its effects on children's numerical competence

Presenting Author:Andrea Wullschleger, University of Zurich, Switzerland; **Co-Author:**Susanne Kuratli Geeler, Pädagogische Hochschule St.Gallen, Switzerland; **Co-Author:**Anuschka Meier-Wyder, Hochschule für Heilpädagogik Zürich, Switzerland; **Co-Author:**Aiso Heinze, Leibniz Institute for Science and Mathematics Education (IPN), Germany; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany; **Co-Author:**Anke Lindmeier, Leibniz Institute of Science and Mathematics Education (IPN), Germany; **Co-Author:**Franziska Vogt, University of Teacher Education St.Gallen, Switzerland; **Co-Author:**Elisabeth Moser Opitz, University of Zurich, Switzerland

Adaptive learning support is a quality feature of effective pre-school education. However, so far research on the effects of learning support provided by preschool teachers on children's mathematical learning is scarce. The present study examines the effects of the quality of pre-school teachers' learning support

on children's mathematical development. In the study, 65 kindergarten classes with a total of 517 children from a German-speaking country participated. Children's mathematical achievement was assessed twice within six months. Video data of mathematical board-game sessions and data from interviews with the teachers were used to analyse the quality of two learning-support measures: micro-adaptive support (learning support during the game session) and macro-adaptive support (planning of the game session). Results of cross-sectional data revealed an impact of the quality of domain-specific learning support (micro-adaptive) on children's mathematical achievement, but there was no evidence of an impact of the quality of social-emotional support (micro-adaptive) and of macro-adaptive learning support. Contrary to expectations, no influence of micro- and macro-adaptive learning support was found with regard to the children's longitudinal mathematical learning gains. Our findings indicate that domain-specific learning support (micro-adaptive) might affect children's mathematical learning positively. It is possible that the effects of learning support in everyday kindergarten life take longer to unfold than during the six months observed.

Quantitative and qualitative aspects of educational dialogue: effects on early science learning

Presenting Author:Anika Bürgermeister, University of Leipzig, Germany; **Co-Author:**Gerlind Grosse, Early Childhood Education Research, Germany; **Co-Author:**Ueli Studhalter, Pädagogische Hochschule Luzern, Switzerland; **Co-Author:**Miriam Leuchter, University of Koblenz - Landau, Germany; **Co-Author:**Henrik Saalbach, University of Leipzig, Germany

Within early-childhood-education, the importance of educational dialogue and adaptive instructional support, i.e. scaffolding is highly discussed for young children's learning. The present study aims at examining quantitative as well as qualitative aspects of teachers' and children's talk within this dialogue and the interaction between them with regard to children's domain-specific knowledge acquisition. In a longitudinal study in 34 Swiss preschool classes, a standardized learning environment was implemented and teachers' use of scaffolding strategies was assessed by using a theory-based category system. Children's early science learning was measured at three measurement points. Subsequently, videos were analyzed, by coding children's and teachers' proportions of talk within this educational dialogue. First of all, findings show positive effects of children's active engagement in these dialogues as well as of teachers' activation of prior knowledge, as a particular scaffolding strategy. Furthermore, results of multilevel-regression-analysis reveal a positive interaction between children's active participation in these dialogues and teachers' activation of prior knowledge. For that, it is beneficial for learning processes to support children to actively participate in educational dialogue and simultaneously activate their prior knowledge. Possible implications for instructional processes and concrete verbal support in the context of early childhood science education are discussed.

Development of pre-academic skills and motivation in preschool classroom quality profiles

Presenting Author:Jenni Salminen, University of Jyväskylä, Finland; **Co-Author:**Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:**Anna-Majja Poikkeus, Department of Teacher Education, University of Jyväskylä, Finland; **Co-Author:**Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

This study examines the differences between classroom quality profiles with respect to children's development in pre-academic skills and motivation across the kindergarten year. Classroom quality (i.e., quality of teacher-child interactions) was observed in 49 kindergarten classrooms with the CLASS Pre-K. Subgroup analyses on children's data were carried out on three profiles representing high to intermediate classroom quality (Profile 1), intermediate classroom quality (Profile 2), and intermediate to low classroom quality (Profile 3). Children's (n = 504) pre-reading and pre-math skills and task behaviors were measured at the beginning and end of the kindergarten year. The children's vocabulary, number knowledge and interest in reading and math were measured at the end of the kindergarten year. The results showed a significant increase in children's number sequence skills and a significant decrease in avoidance and helplessness across the kindergarten year in Profile 1 compared to children in Profile 2. A significant increase was found in helplessness and social dependence for children in Profile 3 compared to the other two profiles. The children in Profile 2 showed a significant decrease in anxiety compared to those in Profile 3, whereas the children in Profile 3 showed less interest in reading than the children in the other profiles and had lower vocabulary scores than the children in the Profile 2 at the end of the kindergarten year. The results provide new understanding about the effect of different combinations of teacher-child interactions on child outcomes.

Session V 6

16 August 2019 17:15 - 18:45

Lecture Hall - H09

Symposium

Learning and Instructional Technology

Fostering Students' (Meta-)Cognition in Digital Learning Scenarios

Keywords: Educational technology, Emotion and affect, Game-based learning, Instructional design, Learning Technologies, Metacognition, Multimedia learning, Science education, Self-efficacy, Self-regulation

Interest group: SIG 07 - Technology-Enhanced Learning And Instruction

Chairperson: Ines Deibl, University of Salzburg, Austria

Organiser: Ines Deibl, University of Salzburg, Austria

Organiser: Stephanie Moser, Technical University of Munich, Germany

Discussant: Joerg Zumbach, University of Salzburg, Austria

Digital learning scenarios offer various means for individualized learning, allowing students to learn in their own ways and pace. However, such self-directed learning environments may overwhelm particularly those persons who are not able to effectively self-direct their own learning. Here, we present diverse approaches investigating how (meta-)cognitive support affects self-regulated learning. In the first paper, the authors examine digital pedagogical agents that provide (meta-)cognitive prompts. Results reveal no main effect for the provision of prompts but present evidence that students' intrinsic motivation positively influenced students' mental effort. Second, learning in a traditional classroom is compared to a flipped classroom with self-regulatory prompts. Findings show that students in the flipped classroom did not use more self-regulated learning strategies than students in the traditional classroom, but the habitual use of such strategies in the first place influenced the use of related actions overall. Third, the authors explore the use of intelligent virtual humans to facilitate learning due to their potential to trigger metacognitive monitoring by expressing facial expressions of emotions. Empirical analyses show that incongruent facial expression dysregulated the students and led to inferior performance. In the fourth paper, the authors investigate the effect of feedback on self-efficacy and self-concept within a serious game to help students grow as self-regulated learners. Results indicate that the interaction with feedback providers led to an increase in self-reported competences and self-efficacy. Taken together, this symposium contributes to a comprehensive understanding of the role of (meta-)cognitive support on learning processes from various perspectives.

Supporting digital Science Education with Pedagogical Agents

Presenting Author:Ines Deibl, University of Salzburg, Austria; **Co-Author:**Joerg Zumbach, University of Salzburg, Austria

In science education, e-learning scenarios became more and more popular and are widely used by educators to illustrate complex learning contents. Especially rather open learning scenarios require students to self-regulate their learning on a high level. In order to actually foster students' knowledge acquisition within such learning scenarios, scaffolding methods like prompts might be beneficial. Within this study, effects of a pedagogical agent as learner support were examined. The pedagogical agent provided metacognitive and cognitive prompts during a self-regulated learning phase. Effects of this instructional approach on knowledge acquisition, metacognitive behavior, motivation and cognitive load were examined. Results reveal no main effect for the provision of prompts by the pedagogical agent, but showed significant impact of covariates such as use of metacognitive strategies, learners' motivation and prior knowledge. Results reveal that students' intrinsic motivation influenced positively students' intrinsic cognitive load and made them to invest a higher mental effort. Students reporting a more frequent use of metacognitive strategies also reported about a higher extraneous cognitive load. We assume here that the complexity of the learning material was too low in order to use metacognitive strategies really efficiently. In addition, learners experienced the support by a pedagogical agent as helpful for learning.

Self-Regulation in Flipped Classrooms – A Study on Learning Process, Outcomes and Experiences

Presenting Author:Stephanie Moser, Technical University of Munich, Germany; **Co-Author:**Doris Lewalter, Technical University of Munich (TUM), Germany; **Co-Author:**Tanja Thurner, Technical University of Munich, Germany; **Co-Author:**Albin Muff, Bayerische Bereitschaftspolizei, Germany

Flipped classrooms (FC) use digital media to reverse traditional learning settings: they offer online-videos and supplemental material that allow for self-regulated learning of basic concepts before class and leave time for practical and individualized learning during class. The present paper explores flipped law classes in the context of Bavarian police training, a traditionally highly structured learning environment. Conveying theoretical legal knowledge as well as its practical application is of high importance for future police staff. FC seems to be an appropriate method to support both. However, fostering students' understanding of underlying law texts is challenging, particularly within a self-regulatory learning environment like FC. Thus, we added prompts into the online-videos that support students' reading and learning strategies. A quasi-experimental setting with pretest-posttest design (N = 91) investigated effects of the FC in comparison to traditional classes (TC). Results show that students in FC did not use more self-regulation strategies compared to students in TC. Further, the overall outcomes of knowledge tests did not show different results between the groups. Moreover, students faced inflexibility as well as technical failures, and experienced non-adaptive instruction. Nevertheless, students enjoyed that the learning material is available online and reported that FC is easy to use. Further, they valued that the courses are more application oriented and that participation is more active during classes. These results indicate that FC learning is in need of 1) further empirical investigation for a better understanding of FC learning and 2) correspondingly designed material and flexible learning environments.

Can External Artificial Agents Impact Learners' Self-Regulation During Complex Multimedia Learning?

Presenting Author:Roger Azevedo, University of Central Florida, United States; **Co-Author:**Michelle Taub, University of Central Florida, United States; **Co-Author:**Megan J. Price, University of Central Florida, United States

Can external regulating artificial agents impact learners' self-regulation during complex multimedia learning? In this study 45 college students solved a series of science problems by integrating multimedia materials (i.e., text and diagrams) and utilized the facial expressions of an intelligent virtual human's emotion (i.e., neutral, confusion, and joy) designed to either facilitate or dysregulate their metacognitive judgements regarding the relevancy of the multimedia materials vis-a-vis the science questions. Learning outcomes, self-report measures, and multimodal multichannel self-regulatory process data (e.g., students' facial expressions of emotions, physiological and eye movement data, log-files) were collected and showed that incongruent facial expression from the intelligent virtual dysregulated the students and led to inferior performance. Lastly, our results have implications for the design of intelligent virtual humans designed to facilitate complex multimedia learning during human-machine interactions.

Improving self-efficacy and self-concept with a serious game: the importance of in-game feedback

Presenting Author:Susanne Narciss, TU Dresden, Germany; **Co-Author:**Felix Kapp, Technische Universität Berlin, Germany; **Co-Author:**Pia Spangenberg, Technische Universität Berlin, Germany

Serious games contain opportunities to develop an adequate self-concept of one's competences and have been proven to enhance the self-efficacy in specific domains such as the STEM area (Meluso, Zheng, Spires, & Lester, 2012). They can contribute to a sense of agency and help students to grow as self-regulated learners. Feedback within the game can provide tutoring components aimed to support students in solving the game tasks in order to provide mastery experiences. This mastery experience combined with verbal persuasion serves as source of self-efficacy (Bandura, 1977). In the present study thirty-nine students played a serious game in which they were asked to self-assess their technical competences and were provided with external and tutoring feedback. The comparison of the pre- and post-assessment of the self-concept of technical competences and the self-efficacy in the domain technology revealed an increase. Students reported higher self-efficacy and a better self-concept after the game. The analysis of the in-game behavior pointed out, that the amount of interaction with the Non-Player-Character in the game (which served as feedback provider) predicted the increase. The results emphasize the importance of designing theory-based feedback within Serious Games.

Session V 7

16 August 2019 17:15 - 18:45

Lecture Hall - H04 - Knorr-Bremse Hörsaal

Symposium

Teaching and Teacher Education

The Relevance of Student Feedback in Teacher Education and Teaching Practice

Keywords: In-service teacher education, Pre-service teacher education, Reflection, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Corinne Wyss, Zurich University of Teacher Education, Switzerland

Organiser: Kerstin Göbel, University of Duisburg-Essen, Germany

Discussant: Jonathan Schweig, United States

The ability to reflect one's own teaching is considered to be a central competence in the teaching profession and is meant to be promoted already in teacher education. The perspectives of students are a valuable source for assessing the quality of teaching in classrooms. Comparing the proper perspective on teaching to student-rated teaching quality can help teachers to reflect upon their action and to identify areas for the improvement of their teaching. However, there is still little research on the impact of student feedback on pre-service and in-service teachers concerning their reflection and improvement of teaching quality. The following symposium consists of four presentations from Germany, Switzerland, the Netherlands and Austria. The first study compares views of students and their in-/pre-service teachers on different aspects of teaching quality, scrutinizing the comparability of measurement across both views. The second study investigates if student feedback via smartphone application promotes teachers' insight into possible improvement of their lessons, if it promotes their reflection and if students perceive a measurable improvement in teaching. The third study investigates the effectiveness of student feedback for promoting pre-service and in-service teachers' quality of and attitude towards lesson reflection. The fourth study examines differences between student teachers and in-service teachers when using student feedback on instruction for reflection purposes.

Using Students' Feedback to Improve Pre-Service Teachers' Aspects of Quality of Teaching

Presenting Author:Georg Krammer, University College of Teacher Education Styria, Austria; **Co-Author:**Barbara Pflanzl, University College of Teacher Education Styria, Austria; **Co-Author:**Gerlinde Lenske, Universität Koblenz-Landau, Germany; **Co-Author:**Marlies Matischek, University College of Teacher Education Styria, Austria; **Co-Author:**Petra Hecht, Pädagogische Hochschule Vorarlberg, Austria; **Co-Author:**Elisabeth Seethaler, Salzburg University of Education Stefan Zweig, Austria; **Co-Author:**Johannes Mayr, Alpen Adria Universität Klagenfurt, Austria

Teacher education should foster the quality of teaching in pre-service teachers. To this end, classes rating pre-service teachers' quality of teaching can be a valuable resource. The class-rated quality of teaching can be compared to one's own self-rated quality of teaching, thereby identifying room for improvement. However, scholars have suggested that these two perspectives may not measure the same constructs. If so, perspectives are not measurement invariant and consequently should not be compared directly. Before this backdrop, this talk scrutinizes whether the quality of teaching assessed by pre-service teachers and their students is directly comparable. 272 pre-service teachers rated themselves and were rated by their 4851 students on three key aspects of quality of teaching. Additionally, data from 622 in-service teachers and their 12229 students was compared to the self-assessment of pre-service teachers. Measurement invariance analyses in multilevel SEM showed that except for one item strong measurement invariance could be established across pre-service teachers and their classes. In contrast to in-service teachers, pre-service teachers consistently rated themselves lower on their quality of teaching than their classes. We conclude that the addressed aspects of quality of teaching can be directly compared across pre-service teachers and their classes. Teacher education should make use of students' feedback, and also strengthen pre-service teachers' awareness of their level of quality of teaching.

Does Smartphone-Assisted Student Feedback Affect Teaching Quality?

Presenting Author:Hannah Bijlsma, University of Twente, Netherlands; **Co-Author:**Adrie Visscher, Univ. of Twente, Netherlands

In this study, student perceptions of teaching quality were measured by means of a smartphone application for providing teachers with feedback on their lesson. It was investigated if student feedback promoted teachers' insight into where they could improve their lessons, and promoted their reflection on their lessons. It was also investigated in what ways teachers worked on improvement, and whether the student feedback affected the quality of their teaching. Teachers reported that they gained insight into their improvements based on the student feedback. They did not seem to reflect statistically significant more on their lessons. Teachers reported improvement-oriented actions in response to the student feedback. According to students, teachers first slightly improved their teaching quality. However, the improvement did not sustain. Explanations for the findings are discussed and suggestions for future research are presented.

The Perception of Student Feedback to Teachers: Perspectives of Pupils, Teachers and Peers

Presenting Author:Corinne Wyss, Zurich University of Teacher Education, Switzerland; **Presenting Author:**Meike Raaflaub, Pädagogische Hochschule Zürich, Switzerland

Feedback from pupils is an essential, yet rarely used method for teaching development. However, the ratings of pupils are significant since they represent an internal view on teaching and can thus be very valuable for the reflection of teaching, teaching quality and the professional competence of the teacher. This intervention project investigates the effectiveness of student feedback for promoting pre-service and in-service teachers' quality of and attitude about lesson reflection. During two terms 233 pre-service teachers for lower secondary education (grades 7 to 9) were asked to collect student feedback during their practical training and to work with it in two different ways: The first intervention group used student feedback to reflect together with a peer whereas a second group used student feedback to reflect individually by writing a reflective journal. Oral transcripts and written journal entries are analyzed with respect to the two different settings and their quality of reflection. In addition, changes of motivation and volition to work with student feedback were measured using a written pre-post-test. Our results show that both pre-service teachers and pupils are generally receptive towards the use of student feedback as a means to enhance teaching quality. The findings of the study can give valuable input for teacher education and teacher professional development concerning the use of student feedback and teacher reflection.

Attitudes of Pre-Service and In-Service Teachers Towards Student Feedback and Reflection

Presenting Author:Kerstin Göbel, University of Duisburg-Essen, Germany; **Presenting Author:**Katharina Neuber, University of Duisburg-Essen, Germany

Students' perceptions of teaching have been proven to be a valid source of information for teachers' reflection on instruction. However, the potential of student feedback for teachers' reflections has barely been investigated so far. Recent studies identified differences between novice and expert teachers in their capability to reflect upon teaching. Therefore, the present study examines differences between student teachers and experienced teachers when using student feedback on instruction for reflection purposes. By ways of a quasi-experimental design different settings for the reflection of student feedback on instruction are implemented during practical term of student teachers and in regular instruction of experienced teachers. The analysis reveals that student teachers in general show more positive attitudes towards structured and collegial reflection and towards using student feedback than do experienced teachers. After the use of student feedback and systematic reflection on instruction as realized within our experimental groups, student teachers reported a positive change in their attitudes towards student feedback. The same was true for experienced teachers, although they did not receive a support for their reflection upon student feedback. However, with regard to attitudes towards structured reflection, student teachers and experienced teachers assess a structured reflection less positive than before student feedback intervention. It seems that the organizational effort and time resources needed for implementing and reflecting student feedback should be taken into account in further studies.

Session V 8

16 August 2019 17:15 - 18:45

Seminar Room - S03

Single Paper

Assessment and Evaluation, Cognitive Science, Higher Education, Motivational, Social and Affective Processes

Metacognition

Keywords: Assessment methods and tools, At-risk students, Cognitive development, Collaborative Learning, Higher education, Learning approaches, Metacognition, Pre-service teacher education, Quantitative methods, Quasi-experimental research, Self-regulation

Interest group: SIG 16 - Metacognition

Chairperson: Gino Camp, Welten Institute - Open University of the Netherlands, Netherlands

Metacognitive awareness among university and secondary school students

Keywords: At-risk students, Cognitive development, Metacognition, Self-regulation

Presenting Author:Marloes Nederhand, Erasmus University Rotterdam, Netherlands; **Co-Author:**Huib Tabbers, Erasmus University Rotterdam, Netherlands;

Co-Author:Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Remigius (Remy) Rikers, UCR / Utrecht University, Netherlands

When compared to high performers, low performers generally have more difficulty to accurately estimate their own performance. This has been explained by low performers being both unskilled and unaware about their performance. However, Miller and Geraci (2011) found that low performing university students also assigned less confidence to their estimates (i.e., second-order judgments, SOJs), indicating some metacognitive awareness of their poor calibration. The current study examined whether the relationship between calibration accuracy and confidence in performance estimates is more general, and exists irrespective of performance level, not only for university students but also for secondary school students. We asked both university students and secondary school students to estimate their exam grade after taking their exam, and to provide a second-order judgement). The results showed that for university students, poor calibration accuracy was indeed accompanied by low confidence scores, independent from performance level, confirming our hypothesis. For secondary school students however, calibration accuracy was unrelated to confidence scores, suggesting a less developed metacognitive awareness.

Learning Behavior Change: the Role of Narratives

Keywords: Higher education, Learning approaches, Metacognition, Self-regulation

Presenting Author:Luotong Hui, Maastricht University, Netherlands; **Co-Author:**Anique de Bruin, Maastricht University, Netherlands; **Co-Author:**Jeroen Donkers, Maastricht University, Netherlands; **Co-Author:**Jeroen Van Merriënboer, Maastricht University, Netherlands

Upon entering university, many students struggle to develop and implement effective learning strategies to achieve their learning goals. Previous research found practice testing and distributed practice are the most effective learning strategies. For students, however, the most frequently used learning strategies are highlighting and rereading, which actually are ineffective learning strategies. For improving learning outcomes, an intervention to change learning strategies is needed. Since people are often resistant to change, simply telling them what strategies work is probably insufficient to persuade them to change. Narratives are considered a widespread method for changing incorrect beliefs and stimulating intention to change. A narrative is a presentation of concrete event(s) experienced by specific exemplar(s) in a specific setting (e.g., a student on video telling about his learning strategy change experience). Through transportation in the narrative world, individuals are likely to change real-world beliefs and develop behavioral intention by reducing counterarguing and increasing connections with exemplars. This study examined if narratives have a stronger effect on changing learning strategies beliefs and stimulating intention to use effective learning strategies than the nonnarrative. The results showed that students who watched narrative videos experienced greater belief change compared to those who watched nonnarrative videos or a control condition video. Moreover, those who reported more engagement in the narrative videos were more likely to report greater intentions to change. **Keywords:** self-regulated learning, learning strategies, narrative, behavior change

Assessing Metacognition in the Learning Process: Construction of the Inventory MILP

Keywords: Assessment methods and tools, Metacognition, Pre-service teacher education, Quantitative methods

Presenting Author:Inka Haehnlein, Martin Luther University Halle-Wittenberg, Germany; **Co-Author:**Pablo Pirnay-Dummer, Martin Luther University Halle-

Wittenberg, Germany

Metacognition influences all phases of learning. The various metacognitive processes are important during different phases of learning and influence them in different ways. The central research objective was the development of an instrument for the assessment of undergraduate students' metacognition in the learning process (MILP). First, 11 scales with a pool of 128 items were created, 6 scales for different activities of metacognitive monitoring and 5 scales for metacognitive regulation processes. The 128-item MILP inventory was assessed for content validity by a panel of 9 experts that resulted in an optimized 78-item version. The MILP Inventory was constructed and validated in two studies using EFA in a first sample ($n = 541$) and CFA in a second sample ($n = 902$) of undergraduate teacher students. The results support a multidimensional, 33-item, 6-factor solution. In its current state, the inventory can trace most of the theoretically expected metacognitive processes before, during and after learning.

The effect of structuring versus reflection-provoking support on students' shared regulation

Keywords: Collaborative Learning, Metacognition, Quasi-experimental research, Self-regulation

Presenting Author:Liesje De Backer, Ghent University, Belgium; **Co-Author:**Hilde Van Keer, Ghent University, Belgium; **Co-Author:**Martin Valcke, Ghent University, Belgium

The present study investigates the impact of two types of metacognitive support (i.e. structuring versus reflection-provoking support) on university students' socially shared metacognitive regulation (SSMR) during face-to-face peer tutoring. Additionally, it studies the relation between students' SSMR and performance. A quasi-experimental repeated measures design was adopted, involving 58 students in the Educational Sciences programme, who were randomly assigned to peer tutoring groups of six. Each group was provided with either structuring (SS) or reflection-provoking (RS) support. The starting, middle, and closing peer tutoring session of four groups in each support condition were videotaped (48h). SSMR was studied by means of systematic observation of students' videotaped regulation behaviour. The score on their group assignment during the respective peer tutoring sessions served as performance measure. Linear mixed effects models were run to investigate the impact of both types of metacognitive support on the occurrence and the scope of students' SSMR as well as to examine the relation between students' adoption of SSMR and their performance. The results revealed that students in the RS-condition adopted SSMR significantly more frequently as compared to students in the SS-condition. Moreover, reflection-provoking support appeared significantly more beneficial for engaging (nearly) all group members in SSMR. No significant correlation was demonstrated between students' SSMR and performance. However, a more nuanced finding was revealed when taking into account the scope of SSMR, since a quasi-full engagement of (nearly) all students in SSMR showed a significant positive correlation with the group's performance.

Session V 9

16 August 2019 17:15 - 18:45

Seminar Room - S01

Single Paper

Teaching and Teacher Education

Pre-Service Teacher Education and Phenomenography

Keywords: Developmental processes, Higher education, Instructional design, Phenomenography, Pre-service teacher education, Qualitative methods, Secondary education, Teacher Effectiveness, Teacher professional development

Interest group: SIG 09 - Phenomenography and Variation Theory, SIG 11 - Teaching and Teacher Education

Chairperson: Natalia Albornoz, Pontificia Universidad Católica de Chile, Chile

Coherence in the context of organizational development – Teacher educators' perceptions

Keywords: Developmental processes, Higher education, Pre-service teacher education, Teacher professional development

Presenting Author:Katharina Hellmann, University of Education Freiburg, Germany; **Co-Author:**Stefanie Vigerske, University of Education Freiburg, Germany

Teacher education and teaching competencies are topics of continuing interest both in scientific research and policy. Political programs emerge periodically aiming at promoting and guiding teacher education. In this context, university-based organizational development and the creation of a coherent teacher education setting become highly relevant. The paper addresses the construction and perception of internal and external coherence in the context of organizational development. Different actors of two German universities that just started working collaboratively in teacher education participated in focus group discussions. Questions about the construction and perception of coherence in the context of organisational development, means of achieving coherence in teacher education, and the effectiveness of the newly developed cooperative structures were discussed. Results show that depending on the interviewed target group, coherence is construed and perceived differently. While the directorial/professorial level mostly used arguments related to aspects of external coherence (e.g. scientific research, policy aspects), the coordinating/administrative level rather mentioned aspects concerning internal coherence (e.g. implementation, technical aspects). Corresponding to that, the effectiveness of the cooperation and goal attainment was evaluated differently in both groups. Consequences for further organizational development and joint research will be discussed and shall help in getting a better understanding of organizational development in universities as complex educational systems.

Beginner Teachers' conceptions of a successful lesson: structure and implications

Keywords: Phenomenography, Pre-service teacher education, Secondary education, Teacher Effectiveness

Presenting Author:Guy Durden, University College London, United Kingdom

This phenomenographic study describes qualitative differences in Beginner Teachers' (BTs') conceptions of a phenomenon central to their routine experience of teaching: the successful lesson. Conceptions were found to be comprised of two independently related components, the structure of the successful lesson and its purpose. Evidence on the structure supports the adoption of a systems approach to BTs' thinking about lessons. Evidence on purpose confirms previous research into conceptions of learning. It was found that a sophisticated understanding of learning is not sufficient to ensure a sophisticated understanding of a successful lesson. These results add to teacher educators' pedagogical content knowledge.

Pre-service teachers' learning of how to teach specific content in a learning study

Keywords: Instructional design, Phenomenography, Pre-service teacher education, Qualitative methods

Presenting Author:Joakim Torång Magnusson, University of Gothenburg, Sweden; **Co-Author:**Angelika Kullberg, University of Gothenburg, Sweden

The aim of this study is to gain deeper understanding of how pre-service teachers (PTs) can develop their teaching skills in regard to how specific content can be taught. Learning study was used as a method to help PTs develop their lesson-planning skills in relation to their students' understanding of the topic. In the study, 25 PTs for Grades 4 to 6 participated in a learning study in natural science. Our research question concerns what pre-service teachers learn about teaching from participating in a learning study. Variation theory was used as a theoretical framework to analyze the data. We used a lesson-planning task as a pre-test of the PTs' planning skills. The pre-test showed that when planning a lesson jointly, the PTs focused primarily on activities that they thought would be considered fun and on the structure of the lesson, and had difficulties in narrowing down what specific content to teach. The PTs were often vague in expressing what they wanted their students to learn and had difficulties assessing what the students had learned after a lesson. After the learning studies, we found that the PTs knew better what they wanted the students to learn, what difficulties the students could have, and got better at considering students' difficulties when planning and analyzing the lesson.

Session V 10

16 August 2019 17:15 - 18:45

Seminar Room - S15

Single Paper

Educational Psychology

Keywords: Cognitive skills, Communities of learners, Educational Psychology, Experimental studies, Goal orientation, Instructional design, Meta-analysis, Motivation and emotion, Multimedia learning, Philosophy, Synergies between learning teaching and research, Technology

Interest group: SIG 06 - Instructional Design, SIG 08 - Motivation and Emotion, SIG 25 - Educational Theory, SIG 27 - Online Measures of Learning Processes

Chairperson: Lillian Liu, The University of Hong Kong, Hong Kong

A Meta-Analysis on Goal Structures and Personal Achievement Goals

Keywords: Educational Psychology, Goal orientation, Meta-analysis, Motivation and emotion

Presenting Author: Lisa Bardach, University of York, United Kingdom; **Co-Author:** Marko Lüftenecker, University of Vienna, Austria; **Co-Author:** Sophie Oczlon, University of Vienna, Austria; **Co-Author:** Jakob Pietschnig, University of Vienna, Austria

Achievement goal theory includes both personal motivational features (achievement goals) and contextual features (goal structures). The theory holds that the prevailing goal structures in learning environments (such as the classroom) influence the achievement goals students adopt. This meta-analysis ($k = 59$, $N = 39,896$) examined the strength of relationships between student ratings of goal structures (mastery-approach goal structures, mastery-avoidance goal structures, performance-approach goal structures, and performance-avoidance goal structures) and achievement goals (mastery-approach goals, mastery-avoidance goals, performance-approach goals, and performance-avoidance goals) as well as potential moderating variables. Results indicated that each achievement goal was most strongly related to its contextual counterpart. Although we found some evidence for a moderating influence of educational level (primary education, lower secondary education, upper secondary education, and tertiary education), heterogeneity remained substantial when accounting for moderators. Based on the findings of our meta-analysis, challenges and promising routes for educational practice and theory building are discussed.

Does congruency of an instructional video's setting with the test setting improve test performance?

Keywords: Educational Psychology, Experimental studies, Instructional design, Multimedia learning

Presenting Author: Martin Merkt, Deutsches Institut für Erwachsenenbildung, Germany; **Co-Author:** Sabrina Lux, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Vincent Hoogerheide, Utrecht University, Netherlands; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Stephan Schwan, Leibniz-Institut für Wissensmedien, Germany

This experiment first aimed to replicate the findings of an exploratory study that found beneficial effects of an authentic setting in an instructional video on retention of the video's contents. However, the main aim was to investigate whether reinstating the setting of the instructional video during the testing phase would improve test performance by means of a context congruency effect. Participants ($N = 149$) watched an instructional video about floral diagrams and floral formulas that was either recorded in a greenhouse (authentic setting) or in front of a white wall (neutral setting). The posttests assessed retention and application of the learning materials. During the posttests, we either displayed the authentic setting or the neutral setting as the background picture for each question. Contrary to our expectations, we did not replicate the findings of the prior exploratory experiment, nor did we find any evidence for context effects. We discuss implications for further research; for instance, the interrelatedness of the individual pieces of information in the learning materials may be a potential boundary condition for context effects. Moreover, we discuss these findings with regard to methodological considerations on how to handle findings from exploratory experiments in the light of the replication crisis in psychology.

Epistemic Principles to Evaluate Theories of Learning and Instruction

Keywords: Communities of learners, Educational Psychology, Philosophy, Synergies between learning teaching and research

Presenting Author: Clark Chinn, Rutgers University, United States; **Co-Author:** Mikko Kainulainen, University of Turku, Finland

The papers in this symposium articulate high-level theories of learning and instruction, focusing on theories drawing upon systems constructs. The field of education has many such high-level theories but needs better epistemic principles that can guide choices among them. In this paper, we begin to articulate such principles. Our analysis is grounded in a broad review of philosophical and social science literatures that provide insights into normative approaches to theory evaluation. These literatures identify a range of ideals that should be met by successful theories. These include some ideals that are met by the theories discussed in this symposium, including plausibility and fruitfulness. However, the general theories adumbrated in this symposium fail to meet a range of critical evidentiary ideals for good theories. These include diagnosticity, severity of empirical tests, and the quantity, replicability, varieties, and consistency of evidence. Choices between theoretical perspectives require more systematic bodies of evidence that can show whether these ideals have been met by theories. The importance of these explanatory ideals points to processes that have figured reliability in the development of other fields but that have been used too seldom in educational research involving comparison of high-level theories. These include developing specific models that can be tested in detail against data and contrasting such models from different high-level theories. Our overall conclusion supports the claim that the appropriate response to the high-level theories under consideration in this symposium is that they should be entertained and vigorously explored rather than adopted or accepted.

Can eye see what you did? Effects of signaling on the interpretation of dynamic gaze displays

Keywords: Cognitive skills, Educational Psychology, Experimental studies, Technology

Presenting Author: Margot van Wermeskerken, Erasmus Medical Center, Netherlands; **Co-Author:** Juliane Richter, Leibniz-Institut für Wissensmedien, Germany; **Co-Author:** Tamara Van Gog, Utrecht University, Netherlands; **Co-Author:** Katharina Scheiter, Leibniz-Institut für Wissensmedien, Germany

Eye tracking not only allows for recording but also for displaying a person's gaze to someone else in order to improve learning or instruction. For instance, an expert's dynamic gaze replay may be used to instruct students how to perform a task or teachers may be shown students' gaze displays to help them diagnose students' task processing. However, in order to use gaze replays in an educational setting, observers must be able to interpret gaze displays unambiguously. Previous studies are promising: observers do seem able to interpret another person's gaze in terms of that person's task performance above chance and seem able to distinguish between high and low confidence of the performer. However, there is much room for improvement. Therefore, we investigated whether providing signaling cues indicating the relevant parts of the task would improve observers' inference making. Students ($N = 100$) completed a multiple-choice graph comprehension task and then interpreted the gaze of others doing the same task with the gaze display overlaid on: 1) the original task (no signaling condition) or 2) the task with relevant information in the task being highlighted (signaling condition). We expected signaling to improve the observers' judgment accuracy of other persons' answers, task difficulty, and confidence, however, results revealed no significant differences between conditions. These findings suggest that judgments were largely based on performers' fixations on the multiple-choice answer options, and therefore the signaling of relevant information may not have added much. Findings, however, might be different for non-multiple choice tasks.

Session V 11

16 August 2019 17:15 - 18:45

Seminar Room - S09

Single Paper

Learning and Instructional Technology, Teaching and Teacher Education

Teaching and Teacher Education

Keywords: Language (L1/Standard Language), Literacy, Mathematics, Pre-service teacher education, Primary education, Problem-based learning, Quasi-experimental research, Student learning, Teaching approaches, Teaching/instruction, Video analysis

Interest group: SIG 11 - Teaching and Teacher Education

Chairperson: Judith Warren Little, University of California, Berkeley, United States

Does Quality of Mathematics Teaching Depend on the Applied Rating Instrument

Keywords: Mathematics, Pre-service teacher education, Teaching/instruction, Video analysis

Presenting Author: Esther Brunner, Pädagogische Hochschule Thurgau, Switzerland

The presented explorative case study analyses the quality of mathematics teaching of one mathematics class with three different high-inference analysis instruments. The question is to which extent the teaching quality receives similar or divergent ratings, in particular regarding the more content-specific quality aspects, e. g. mathematical coherence and correctness. The applied instruments differ in their theoretical perspective, in the quality aspects they focus on and in their inclusion of non-domain-specific and domain-specific aspects of teaching quality. A comparison of the quality ratings indicates that their results vary depending on the analysis instrument used. In particular, the instruments do not take account of shortcomings in technical correctness in the same way.

Benefits and Drawbacks of the Teacher Echo: Findings from a Video Study

Keywords: Language (L1/Standard Language), Quasi-experimental research, Teaching approaches, Video analysis

Presenting Author: Detlef Urhahne, University of Passau, Germany; **Co-Author:** Chunjie Zhu, University of Passau, Germany; **Co-Author:** Marlene Wagner, University of Passau, Germany

The teacher echo refers to teachers' almost verbatim repetition of student responses and can be used to provide implicit feedback about students' achievement or understanding. It is a relatively simple but nuanced type of teacher feedback with rewarding, reinforcing, correcting or questioning character. Some strong arguments speak for using the teacher echo in the classroom. Students may receive better constructive support through quick feedback and interactive classroom discourse and may gain more knowledge by teacher's repetition of key facts and messages. There are, however, extremely powerful arguments against the use of the teacher echo. Students are said to be less cognitively activated by constant repetitions of their answers and kept on a short leash by the teacher who dominates a tensionless classroom talk. Echoing student answers is therefore in some countries a possible strategy of classroom discourse, but in others regarded as a bad habit and consequently tabooed as an instructional method. In order to gather empirical evidence about this conflicting kind of teacher feedback, two short videos of a simulated lesson with and without teacher echo were created. A sample of 410 teacher trainees was asked to rate the perceived instructional quality and answer a knowledge test about the lesson contents. Results showed no significant differences in perceived cognitive activation and teacher dominance, but higher perceived constructive support and better knowledge acquisition when using the teacher echo. Even though the teacher echo does not lead students to new ideas, limited use seems to be more beneficial than harmful.

How students' reading skills associate with teachers' reading instruction in Grade 1 classrooms?

Keywords: Literacy, Primary education, Teaching/instruction, Video analysis

Presenting Author: Jenni Ruotsalainen, University of Jyväskylä, Finland; **Co-Author:** Eija Pakarinen, University of Jyväskylä, Finland; **Co-Author:** Anna-Maija Poikkeus, University of Jyväskylä, Finland; **Co-Author:** Marja-Kristiina Lerkkanen, University of Jyväskylä, Finland

(Study 1) In Grade 1 fall, Finnish students' reading skills differ extensively from non-readers to rather fluent readers, which challenges the teachers to provide instruction that is adapted to students' skills. In the present study, the aim was to examine to what extent students' pre-reading and reading skills are associated with teachers' reading instruction in Grade 1 fall when formal reading instruction has just begun. Students' (n = 562) pre-reading and reading skills in 32 classrooms were tested in Grade 1 fall. In addition, video-recorded literacy lessons in these classrooms were analyzed with respect to the amount of code-focused (CF, e.g. phonics), meaning-focused (MF, e.g. comprehension tasks), and the amount of differentiation during the lessons. Preliminary results from path analyses showed that teachers differentiated their instruction more and provided more CF activities if students had low pre-reading skills. These results suggest that teachers are more likely to provide strong support for students with lower pre-skills even though teachers are also instructed to provide tasks that are more challenging to students who can already read. Reading acquisition is rapid in Finland due to the transparent orthography of Finnish language which is perhaps also why teachers are likely to give strong support for students' reading acquisition.

Measuring scaffolding-interaction in authentic classroom environments

Keywords: Problem-based learning, Student learning, Teaching/instruction, Video analysis

Presenting Author: Hanna Mach, Goethe-Universität Frankfurt, Germany; **Co-Author:** Rico Hermkes, Goethe-Universität Frankfurt, Germany; **Co-Author:** Gerhard Minnameier, Goethe-Universität Frankfurt, Germany

The objective of our study is (1) to measure the process of scaffolding in teacher-student interactions and to (2) assess scaffolding quality in a reliable and valid way. We have developed a coding instrument, which allows us to capture meaningful coding units (entire scaffolds) and to determine their adaptivity (contingency). We present empirical data from a video study where we evaluated contingency rates for single teachers and tasks. Of the total of 281 scaffolds, 232 were rated as contingent and 49 as non-contingent. Contingency rates varied between 66.7 and 93.1 percent. The percentage of contingent scaffolds differed between our teachers. Our instrument also enables us to localize crucial points in teacher's supporting behaviour and to identify specific mistakes in the course of lessons, which cannot be accomplished with global ratings. Contingency rates were also calculated for tasks, values varying between 60% and 100%. The total number of scaffolds ranged between 4 and 47 for each task. The percentage of non-contingent patterns increased with progressing tuition time.

Session V 12

16 August 2019 17:15 - 18:45

Seminar Room - S06

Single Paper

Culture, Morality, Religion and Education, Teaching and Teacher Education

Teacher Professional Development

Keywords: Collaborative Learning, Conversation/ Discourse analysis, Educational attainment, Lifelong learning, Morality, Primary education, Qualitative methods, Self-efficacy, Teacher professional development

Interest group: SIG 11 - Teaching and Teacher Education, SIG 13 - Moral and Democratic Education, SIG 14 - Learning and Professional Development, SIG 15 - Special Educational Needs

Chairperson: Christian Tarchi, University of Florence, Italy

Understanding collaborative learning of mathematics through positioning theory

Keywords: Collaborative Learning, Conversation/ Discourse analysis, Qualitative methods, Teacher professional development

Presenting Author: Sonia Felix, University of Lisbon, Portugal

The educational reform efforts highlight collaboration among the teachers as a way to improve quality offering of education in the schools. The collaborative aspects are well integrated into the guidelines of reform curriculum indicated through phrases namely "exploring ideas together", "inquiry learning", "working in teams", "learning from each other" etc. The present study explores learning of primary mathematics teachers within context of teacher training sessions where they work in collaborative settings in order to understand and implement principles and pedagogy proposed by the New Curriculum in Portugal (ME, 2007). Through this study, I am searching for analytical tools that can provide evidence about teachers learning within these teacher-training sessions where teachers collaboratively engage in processes of learning about their changing professional needs of mathematics teaching. In this paper, I will present the case of a teacher (Fan). I will utilize positioning theory developed by Rom Harré and Luk Van Langenhove for illustrating how this teacher takes particular positions as a way to engage in the processes of doing professional mathematical learning as promoted through the training sessions of the program.

Potential Influencing Factors for Teachers' Self-Efficacy Beliefs concerning Inclusive Education

Keywords: Primary education, Qualitative methods, Self-efficacy, Teacher professional development

Presenting Author: Frank Hellmich, Paderborn University, Germany; **Co-Author:** Marwin Felix Löper, Paderborn University, Germany; **Co-Author:** Margarita Knickenberg, University of Bielefeld, Germany

Primary school teachers' self-efficacy beliefs are considered to be important prerequisites for the implementation of learning environments for children with and

without special educational needs in inclusive classrooms. Self-efficacy beliefs are understood as individuals' perceived own abilities to achieve specific aims (Bandura, 1997). In recent studies, correlations between teachers' self-efficacy beliefs regarding the implementation of inclusive education, prior experiences in joint education of children with and without special educational needs, and their attitudes towards inclusion were carried out (e.g., Bosse, Henke, Jäntschi, Lambrecht, Vock, & Spörer, 2016; Hellmich & Görel, 2014). Until now, there are hardly any studies dealing with other prerequisites for teachers' self-efficacy beliefs. Thus, it is unclear which individual and institutional factors influence primary school teachers' self-efficacy beliefs concerning the implementation of inclusive education. Against this background, $N=25$ primary school teachers participated in our study. Based on structured interviews, they provided information on their self-efficacy beliefs concerning the implementation of inclusive education and their views on inclusion and its possibilities in schools. The results of our study indicate that primary school teachers declare neutral to moderately positive self-efficacy beliefs regarding the implementation of inclusive education. Primary school teachers explain that their self-efficacy beliefs are influenced by several institutional factors (e.g., school equipment, personal, teaching material) as well as participations in in-service trainings. Furthermore, primary school teachers perceive themselves as more efficient in inclusive education in cooperation with special needs teachers than on their own.

Ethical school leadership in Estonia and Finland: Multiple case studies of exemplar principals

Keywords: Educational attainment, Morality, Qualitative methods, Teacher professional development

Presenting Author:Eve Eisenschmidt, Tallinn University, Estonia; **Co-Author:**Elina Kuusisto, University of Humanistic Studies, Netherlands; **Co-Author:**Katrin Poom-Valickis, Tallinn University, Estonia; **Co-Author:**Kirsi Tirri, University of Helsinki, Finland

This study investigates ethical school leadership in Estonia and Finland. Both countries have Europe's highest achieving students in PISA studies. However, the countries have very different historical backgrounds that have influenced the values and educational climate in schools. Four principals, two from both countries, were identified as moral exemplars who demonstrate strong long-term commitment to ethical causes that goes beyond their own interest. In our research we are exploring (1) what kind of moral incidents exemplar school principals in Estonia and Finland identify in their work, and (2) what kind of moral virtues these principals display in their reflections on these moral incidents. Results show that critical incidents identified by principals were moral concerns related to me as a principal, working with teachers, students and families and with community. Results indicate that the dominant displayed virtue was wisdom and knowledge. Estonian principals paid more attention to parents' involvement and Finnish principals are dealing carefully with the diversities of the students and families. Principals' values and virtues should be paid a lot more attention to in leadership training. *Keywords:* ethical leadership, moral values, Estonia, Finland

Development profiles: How teachers' collaborative attitudes, knowledge and skills improve?

Keywords: Collaborative Learning, Lifelong learning, Qualitative methods, Teacher professional development

Presenting Author:Niina Impiö, University of Oulu, Finland; **Co-Author:**Pirkko Siklander, University of Oulu, Finland; **Co-Author:**Sanna Järvelä, University of Oulu, Finland

Recent studies indicate that teachers do collaborate in their work, but their collaborative practices have not yet established. This longitudinal study was aimed at increasing the understanding of the multidimensional phenomenon of the teachers' improvement of collaborative competence. The study was conducted within two-year master's programme studies with two separately study group during the years 2009-2014. Teachers ($N=25$) from different fields participated in the study. The data consists of 67 interviews and 124 analytical written self-reflections. A qualitative data-driven content analysis focused on how teachers describe the improvement of their collaborative attitudes, knowledge and skills during the master's programme studies and after the graduation in their work. Teachers' descriptions considered three aspects of collaboration: personal orientation, pedagogical understanding, and agency in school community. These aspects include five categories, namely attitudes and beliefs towards collaborative learning, awareness of collaborative skills, theoretical and practical understanding about collaborative learning, thinking of students' learning and teaching practices, and considering one's own possibilities to promote collaborative practices in school communities. Based on the indicators four development profiles were defined: Developer of personal abilities, Developer of teaching practices, Peer supporter among colleagues, and School community developer. The results contribute for teacher training and teachers' in-service training by providing new insight for enhancing teachers' collaborative ways of working and understanding various levels of teachers collaborative competence.

Session V 13

16 August 2019 17:15 - 18:45

Seminar Room - S04

Single Paper

Learning and Instructional Technology, Learning and Social Interaction

Facilitating Productive Classroom Conversations in Computer-supported Learning Activities

Keywords: Computer-supported collaborative learning, Conversation/ Discourse analysis, Educational technology, Science education, Social interaction, Teacher professional development, Teaching/instruction

Interest group: SIG 10 - Social Interaction in Learning and Instruction

Chairperson: Anniken Furberg, University of Oslo, Norway

Developing a model for teacher professional digital competence

Keywords: Educational technology, Social interaction, Teacher professional development, Teaching/instruction

Presenting Author:Annika Lantz-Andersson, University of Gothenburg, Sweden; **Presenting Author:**Mona Lundin, Göteborg university, Sweden; **Co-Author:**Ewa Skantz Åberg, University of Gothenburg, Sweden; **Co-Author:**Pia Williams, Göteborg university, Sweden

Abstract This paper presents a model for teacher professional development and a pilot study where the model is used will be carried out. The background of the developed model is the strong focus on digitalization of education in policies and curricula, implying changed conditions for the teaching profession. With the objective to develop a sustainable model for innovative practice principles, the focus is on teachers' abilities to use and customize digital technologies related both to a specific content and to students' learning, referred to as professional digital competence (PDC). The pilot study will be carried out in one preschool class/preparatory class, which is from 2018 a mandatory Swedish school form. Grounded in a practice- and design based research approach, the study involves educational researchers, teachers and IT-experts co-designing instructional digital scenarios. The aim of the pilot study is a) to collaboratively identify what kind of PDC is needed for teaching with digital technologies, and b) to inform and develop the practice-based sustainable professional development model so that it eventually also can become generally useful for teacher professional development. The model involves a five-phase process: 1) Workshops to collaboratively design instructional scenarios based on specific curricula content and relevant digital tools, 2) Online discussions in a closed Facebook-group to resolve the scenarios, 3) Implementation and video-documentation of instructional scenarios in the preschool classrooms 4) Stimulated recall interviews with teachers using the video-documented scenarios as stimulus material, 5) Online discussions to develop and evaluate the instructional scenarios and the professional development model.

Teaching and learning in a technology-rich makerspace: The meaning of social objects

Keywords: Computer-supported collaborative learning, Conversation/ Discourse analysis, Social interaction, Teaching/instruction

Presenting Author:Kristiina Kumpulainen, University of Helsinki, Finland; **Presenting Author:**Anu Kajamaa, University of Helsinki, Finland; **Co-Author:**Antti Rajala, University of Helsinki, Finland

Abstract Whereas there is a substantial body of literature dealing with the role of conversations in teaching and learning, less attention has been directed to the meaning of materialities for in these interactions. To this end, we draw on data on a technology-rich makerspace in a Finnish school in which students engaged in STEAM (Science, Technology, Engineering, Arts and Mathematics) design activities with various traditional and novel material objects. Our study is based on the sociocultural theorising on tool-mediation (Vygotsky, 1986, 1997), Bakhtinian inspired notion of the "dialogic space" (Wegerif, 2011), and material-discursive onto-epistemology (Barad, 2003, 2007). We define the materialities of the makerspace as "social objects" when integrated in the material-dialogic spaces of ongoing teaching and learning. We ask; How do social objects intra-act in the material-dialogic spaces of teaching and learning in a technology-rich

makerspace? and What are the consequences of these intra-actions for teaching and learning in the makerspace? The data comprise 75 hours of video recordings of students aged 9 and 12 years old (N=94) working in the makerspace over one semester. The study shows how the material objects of the makerspace were transformed into social objects in the material-discursive spaces of teaching and learning, the activity being primarily *about* the objects, *around* the objects and *with* the objects. Our research also points out how materiality is an important mediator of power and educational equity, making materiality a pivotal research focus for future studies in education.

Interactive whiteboard activities as means for facilitating productive whole-class conversations

Keywords: Computer-supported collaborative learning, Conversation/ Discourse analysis, Science education, Teaching/instruction

Presenting Author:Kenneth Silseth, University of Oslo, Norway; **Presenting Author:**Anniken Furberg, University of Oslo, Norway

Abstract This paper reports on a study on the facilitation of whole-class conversations supported by the use of an interactive whiteboard (IWB) activity in the context of school science. Within the field of computer-supported collaborative learning, several studies have provided valuable knowledge about how various forms of digital resources can support student learning in small-group activities. Less attention however, has been provided to computer-supported collaborative learning within whole-class settings, as well as the role of the teacher as a facilitator of whole-class conversations. By taking a sociocultural and dialogic approach, the present study aims at scrutinizing how the use of IWB activities can support teachers' facilitation of whole-class conversations. The empirical setting for the present study is a science project about genetics involving lower secondary school students and their teacher. The analytical focus is on microanalyses of student interactions taking place during group work activities and student-teacher interactions within a succeeding whole-class setting involving a digital tool designed for a drag&drop activity on an IWB. The analyses show how the IWB activity becomes a powerful tool for consolidating experiences from small-group activities, as well as becoming a resource for facilitating dialogic spaces in which students are positioned as authoritative and accountable participants. Most importantly however, the analysis shows the considerable effort needed by the teacher in order to realize the potential of digital tools for engaging in science matter across different activities in technology-rich learning environments.

Facilitating participation in productive class dialogues with educational microblogging

Keywords: Computer-supported collaborative learning, Conversation/ Discourse analysis, Social interaction, Teaching/instruction

Presenting Author:Ingvill Rasmussen, University of Oslo, Norway; **Co-Author:**Ole Smørdal, Department of Education, Norway; **Co-Author:**Paul Warwick, University of Cambridge, United Kingdom; **Co-Author:**Jo Inge Johansen Frøytlog, University of Oslo, Norway; **Co-Author:**Victoria Cook, University of Cambridge, UK, United Kingdom; **Co-Author:**Louis Major, University of Cambridge, United Kingdom

Abstract Classroom discussions with few participants may hinder the quality of class dialogues and limit learning outcomes. In this paper, we consider how 15 teachers in the UK and in Norway creatively adopted and explored research-based resources based on the *Thinking Together* program and *Talkwall.net*, the educational microblogging tool. The aim was to understand how the teachers made use of these resources, developed their dialogic teaching skills, and contributed to improved design of the research-based resources. We characterised 52 lessons and have identified common patterns of how teachers facilitate students to reason, elaborate and question ideas supported by Talkwall. How teachers use shifts between whole-class and group activity is a key aspect, as teachers may share digital contributions from group work to improve whole-class dialogues, or may use whole-class dialogues for students to account for their group activity.

Session V 14

16 August 2019 17:15 - 18:45

Seminar Room - S05

Single Paper

Higher Education

Approaches for Integration of Refugees in Education in Host Countries

Keywords: At-risk students, Computer-supported collaborative learning, Cultural diversity in school, E-learning/ Online learning, Higher education, Language (Foreign and second), Second language acquisition

Interest group: SIG 04 - Higher Education

Chairperson: Ron Pat-EI, Open University, Netherlands

The role of social and cultural capital in the education of newcomer English learners

Keywords: At-risk students, Cultural diversity in school, Language (Foreign and second), Second language acquisition

Presenting Author:Rabia Hos, University of Rhode Island, United States

There is an increasing number of specialized programs in U.S. schools and colleges aimed at supporting newcomer immigrant and refugee English Learners' (ELs') linguistic, social, and academic development. Using data from a larger ethnographic study of newcomer programs, I explore the role of newcomer schools as social networks that provide its members with social and cultural capital that could be used to ease the integration of immigrant and refugee newcomer ELs into American society and education system. Data was collected during two academic years in two different secondary schools in different states in the U.S. via semi-structured interviews with students, parents, school administrators, and teachers of newcomers. The newcomer programs can be seen as hierarchical network that works to help ELs to adapt to the American education system. The findings include the processes of social and cultural adaptation for the youth. The results suggested that (1) schools position newcomer immigrant and refugee ELs as a homogenous group whose primary needs are related to language development and social integration, 2) although there is a desire across all school personnel to support the newcomer students, there are subtle discriminatory practices that are invisible, and 3) although not recognized many newcomer ELs possess different forms of capital that are not valued in schools.

Free digital education for migrants and refugees in Europe: views from learners and stakeholders

Keywords: At-risk students, Computer-supported collaborative learning, E-learning/ Online learning, Higher education

Presenting Author:Jonatan Castaño, European Commission - Joint Research Centre, Spain

Governments and stakeholders are more and more considering free-of-charge digital learning (FDL), including Massive Open Online Courses (MOOCs), as an alternative to provide education to migrants and refugees in Europe. This paper presents an overview of the main results of the [anonymized] project. Based on qualitative data from focus groups with 39 migrants and refugees, and interviews with representatives of 10 FDL initiatives, the paper provides recommendations on how to tailor FDL offer to the needs and characteristics of migrants and refugees. Awareness raising, personalization, guidance, blending face-to-face and online courses, increased recognition and collaboration among stakeholders are considered key success elements. In the future, the adequacy of these design recommendations should be validated by impact evaluation of the initiatives.

Specific Factors for Refugees Dropping Out of an Online Study Program

Keywords: At-risk students, Computer-supported collaborative learning, E-learning/ Online learning, Higher education

Presenting Author:Roland Happ, Johannes Gutenberg University Mainz, Germany; **Co-Author:**Franziska Reinhardt, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Olga Zlatkin-Troitschanskaia, Johannes Gutenberg-Universität Mainz, Germany; **Co-Author:**Sarah Nell-Mueller, Johannes Gutenberg-Universität Mainz, Germany

Kiron Open Higher Education (Kiron) provides a free digital higher education study program for refugees worldwide based on Massive Open Online Courses (MOOCs). However, high dropout rates of over 80% are a well-known problem in MOOCs education in general (e.g. Liyanagunawardena et al., 2013). Our study examines the influences of refugee students dropping out, and to what extent personal internal and external (e.g. technical) factors, i.e. specific learning environment in a host country, play a significant role. To this end, refugees registered at Kiron Open Higher Education (Kiron) (N=1376) who weren't active in the three months were surveyed (n=936 using an online questionnaire, and 180 refugee students participated in this survey). The results show that there are no significant differences with regard to personal factors (language skills, cognitive ability, learning motivation, self-efficacy) between active (n=335) and dropout

students (n=181). Moreover, it becomes evident that personal external circumstances (e.g. family & financial situation) in particular create a significant barrier to online studying. Although the existing infrastructure in the form of an online learning platform such as Kiron is considered positive, the results indicate a problematic external learning environment of refugees that often hinders successful online studying. These findings indicate specific challenges regarding the integration and study success of refugees through online programs.

Student Support in the Context of MOOC-based Online Education for Refugees

Keywords: At-risk students, Computer-supported collaborative learning, E-learning/ Online learning, Higher education

Presenting Author:Patricia Arnold, Munich University of Applied Sciences, Germany; **Co-Author:**Belma Halkic, Munich University of Applied Sciences, Germany

Access to higher education for refugees is currently a pivotal challenge for individuals concerned and universities in host countries. Various digital initiatives try to tackle this challenge with online education solutions (Colucci et al. 2017). One of them, Kiron Open Higher Education (Kiron), provides online curricula in different study tracks that use Massive Open Online Courses (MOOCs) as their basis and a broad spectrum of online and offline measures to support refugees as online learners. However, little is known about what support measures different groups of refugee online learners need. Against this backdrop, we assess the impact of the Kiron support measures, in combination with the online curricula via MOOCs. The research design is a mixed methods approach using quantitative student data of a particular student cohort (n=1375), online surveys and follow-up qualitative structured interviews and focus groups. Results show that, despite of the well-designed, state-of-the-art academic model of Kiron, only a small percentage of students are following the planned learning trajectories through the academic model. While refugee students who use the support offers at Kiron are mostly satisfied and evaluate these positively, they also face difficulties which are not sufficiently covered by existing support services and mostly lie beyond the online study context. Conclusions can help (higher) education institutions reshape existing and create new support services for refugee students, in particular in the context of MOOCs as a study or preparatory offer.

Session V 15

16 August 2019 17:15 - 18:45

Seminar Room - S14

Single Paper

Higher Education, Learning and Instructional Technology, Motivational, Social and Affective Processes

Learning Analytics

Keywords: Competencies, Emotion and affect, Higher education, Learning analytics, Problem solving, Problem-based learning, Quantitative methods, Reflection, Self-regulation, Teacher professional development, Vocational education

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion, SIG 27 - Online Measures of Learning Processes

Chairperson: Mari-Pauliina Vainikainen, Finland

Profiles of learning activity emotions: how boredom and enjoyment stand out

Keywords: Emotion and affect, Higher education, Learning analytics, Problem-based learning

Presenting Author:Dirk Tempelaar, Maastricht University, Netherlands

This empirical research into the learning experiences of more first-year university students taking a challenging course introducing mathematics and statistics, investigates profiles of activity emotions, based on the framework of Control-Value Theory of Achievement Emotions. Latent-class analysis results in six classes that are consistently positioned in the space of learning emotions, with one exception: a single latent class with high levels of boredom and low levels of enjoyment, relative to the levels of other learning emotions. In a subsequent analysis, we investigate differences in learning dispositions between the latent classes, and find differences in students' epistemological views, their effort beliefs, expectancy-based learning attitudes, metacognitive regulation, goal setting behavior and learning motivation and engagement. Implications for education are discussed.

Learning analytics: The paradox of compassionate teaching

Keywords: Higher education, Learning analytics, Reflection, Teacher professional development

Presenting Author:Marion Blumenstein, University of Auckland, New Zealand; **Co-Author:**Steve Leichtweis, The University of Auckland, New Zealand

Increasingly, higher education (HE) providers leverage learning analytics (LA) for the optimization of student engagement and success with a focus on improved academic outcome and retention. However, few studies have investigated the impact of analytics-informed tertiary teaching practice on the changing role and identity of teachers. The current study explores the teacher and student perspective on utilising an open-source LA tool in very large first year undergraduate courses in science, business and arts. The tool, OnTask, allows teachers to send personalised email messages to students based on their individual LA data. The overall aim of this study is to promote positive changes to learning design practice by involving teachers, student advisors, academic developers, and students to collaboratively co-generate new knowledge on how to address issues of student disengagement in very large, commonly team-taught undergraduate classes. Using a qualitative case study approach guided by participatory action research this paper presents a subset of data derived from semi-structured interviews with teachers (N=9) around changes to practice through their interactions with LA. An inductive analysis of interviews revealed two main themes, the first is challenges to implementation comprising LA expertise, workload issues, and LA effectiveness. The second theme, LA as enabler of good teaching, identified positive changes in teachers' perceived approachability to students. Teachers were more compassionate and self-reflective using LA as a teaching tool. This key insight, together with the notion of creating a culture of care at scale in tomorrow's HE will be discussed further.

Self-regulation in 429 Math exercises over seven weeks of learning; a cluster analysis

Keywords: Emotion and affect, Learning analytics, Quantitative methods, Self-regulation

Presenting Author:Bart Rienties, Open University, United Kingdom; **Co-Author:**Dirk Tempelaar, Maastricht University, Netherlands; **Co-Author:**Quan Nguyen, Open University, United Kingdom; **Co-Author:**Allison Littlejohn, Open University, United Kingdom

With the arrival of fine-grained log-data and the emergence of learning analytics, there may be new avenues to explore how Self-Regulated Learning (SRL) can provide a lens to how students learn in blended and online environments. In particular, recent research has found that the notion of time may be an essential but complex concept through which students make (un)conscious and self-regulated decisions as to when, what, and how to study. In this large-scale empirical study of 1035 business students who worked on 429 mathematics exercises in Sowiso, we used temporal analytics to explore how (self-reported) self-regulated learning aligned with how these students made learning decisions over time, and how this decision-making impacted their academic performance. Using cluster analyses of Sowiso log-data, in conjunction with three learning disposition instruments, our findings indicate that timing decisions how students chose to engage with Sowiso was the main predictor for academic performance. Timely preparation was related to students' approaches to learning, epistemic learning emotions, and, in particular, learning emotions. Future research should explore how students might change their SRL over time, and how this might be effectively supported with appropriate learning analytics interventions.

Logfile and protocol-based analysis of domain-specific problem-solving processes

Keywords: Competencies, Learning analytics, Problem solving, Vocational education

Presenting Author:Felix Walker, Technical University of Kaiserslautern, Germany; **Co-Author:**Andrea Faath-Becker, Technical University of Kaiserslautern, Germany

The aim of the lecture is to analyze domain-specific problem-solving processes in the profession of electronics technician for automation technology for the first time. For the analysis of the problem-solving process two diagnostic approaches are used. Based on written protocols of the problem solving process (n=318) and computer-based log data of the problem solving process (n=89), the strategies underlying the problem solving process are analyzed. The core research questions of the presentation are a) the extent to which strategies and, if applicable, mixed forms can be identified in the problem-solving process can be identified, and b) which relationship exists between the problem-solving process and the result of the problem-solving process. The analysis of the written

protocols revealed three cluster solutions across the problems, which identified mixed types of strategies as well as symptomatic and topographical ones. With regard to the success of the problem-solving process, the probability of success was high when a topographic strategy was applied and a strategy change was made (symptomatically then topographically). The probability of success was low when a purely symptomatic strategy was applied. The logfile analyses have not yet been completed, but will be before the conference. In a preliminary analysis based on a fault case, the same clusters can be identified as in the written logs. Deepening logfile analyses and the limits of the theoretical and the diagnostic approach will be discussed.

Session V 16

16 August 2019 17:15 - 18:45

Seminar Room - S10

Single Paper

Assessment and Evaluation, Higher Education, Motivational, Social and Affective Processes

Self-Regulation

Keywords: Developmental processes, Goal orientation, Higher education, Motivation, Motivation and emotion, Peer interaction, Quantitative methods, Secondary education, Self-efficacy, Self-regulation, Survey Research, Teaching approaches

Interest group: SIG 04 - Higher Education, SIG 08 - Motivation and Emotion

Chairperson: Caroline Mansfield, Australia

How do students learn? Learning Strategies and Motivation

Keywords: Goal orientation, Higher education, Self-efficacy, Self-regulation

Presenting Author: Anne Frieda Doris Kittel, Ulm University, Germany; **Co-Author:** Ulrike Nett, Augsburg University, Germany; **Co-Author:** Lisa Respondek, Ulm University, Germany; **Co-Author:** Tina Seufert, Ulm University, Germany

Self-regulated learning is important for successful learning and requires the use of cognitive, metacognitive and resource strategies. Yet, the selection and application of these strategies is partly dependent on motivational beliefs like goal orientations or self-efficacy. However, the specific interplay of strategic and motivational aspects is not explored extensively. Thus, this study explores the direct and indirect relations between goal orientations, self-efficacy, learning strategies and performance. We investigated 3871 students of varying subjects in lectures at semester beginning and received additionally the permission of 1712 students to obtain their grade from the institutional records. Structural equation modeling revealed that mainly mastery goal orientation was associated with cognitive, metacognitive and resource strategies, while performance goal orientation was weakly or not related. Additionally, we found that self-efficacy was directly connected with effort and metacognitive regulation. For performance, we found that effort regulation had the strongest positive relation and self-efficacy a small one, while surprisingly monitoring and time management had a small negative association. This might be explained by an unduly time focus of monitoring. In practice, instructors could provide students with strategies to develop mastery goals and to improve self-efficacy.

A transitional academic year to higher education: challenges, experiences and strategies at the FYUP

Keywords: Developmental processes, Higher education, Secondary education, Self-regulation

Presenting Author: Javier Fernández, Universidad Autónoma de Madrid, Spain; **Co-Author:** Ernesto Panadero, Universidad Autónoma de Madrid, Spain; **Co-Author:** Daniel García, Universidad Europea de Madrid, Spain

The last academic year level before entering the university (FYUP) can be challenging for the students due to a stressful learning context guided by the high stakes university entrance exam plus the coming change to a new educational level. Therefore, it is important to explore what happens exactly in those years to better understand how students are coping. Our aim was to explore students' experiences and strategies use during the final year university preparatory courses, and what are their expectations about their first year at the university. 75 students were interviewed, and we carried out the data analysis using quantitative and qualitative procedures. Participants find the FYUP as a highly challenging year. Also, most of them present a lack of regulatory skills, regarding study strategies, motivational and emotional regulatory strategies. Our results shed light on the students' perceptions about the FYUP, and show the regulatory strategies that they use to deal with this challenge.

Do Friends have Similar Levels of Academic Motivation at School? A Social Network Study.

Keywords: Motivation, Peer interaction, Self-regulation, Survey Research

Presenting Author: Laura Burgess, University of Reading, United Kingdom; **Co-Author:** Carolyn McNabb, University of Reading, United Kingdom; **Co-Author:** Patricia Riddell, University of Reading, United Kingdom; **Co-Author:** Amy Fancourt, BrainCanDo Centre for Research, Queen Anne's School, United Kingdom; **Co-Author:** Kou Murayama, University of Reading, United Kingdom

High levels of self-determination and intrinsic motivation are two key contributors to academic success. Additionally, it is acknowledged that peer groups have influence on the development of such motivation and engagement. The current study considers the effect of peer group on academic motivation, measuring individual students' levels of interest, self-regulation and agentic engagement, using two different methods from network science to examine peer group effects. Data are analysed to assess similarity trends of motivation between friendship dyads. Furthermore, we measure the degree and eigenvector centrality in the social networks, examining how centrality in the networks relates to our measures of motivation. Overall, levels of agentic engagement appear to be similar between connected individuals at the pair level and are also significantly predicted by high levels of eigenvector centrality. Moreover, English interest is also significantly predicted by levels of eigenvector centrality, indicating that those in a more influential position in their network have similarly high levels of interest in English. Overall, these results provide useful insight into the impact that peer groups can have on motivation in school environments and highlights a potential area of focus for school interventions, fostering environments where motivation is lifted by influential members of a social group.

Perceived autonomy support as multifaceted environmental antecedent of achievement emotions

Keywords: Motivation and emotion, Quantitative methods, Self-regulation, Teaching approaches

Presenting Author: Stefan Markus, University of Wuppertal, Germany

The control-value theory of achievement emotions (Pekrun, 2006) assumes that perceived control and values are of crucial importance in the arousal of emotions. Amongst other distal factors, autonomy support affects learners' control and value appraisals. Students' perceived autonomy support therefore is a substantial factor for class- and learning-related academic emotions. However, only weak to medium correlations between autonomy support and achievement emotions could be shown so far. One reason could be an often undifferentiated inquiry of autonomy support.

The aim of the recent study is to examine differential relationships between students' perceived autonomy support, their control and value appraisals and achievement emotions. The effects of different aspects of autonomy support are investigated.

In this cross-sectional trait-study on secondary school level (N=1344) the structure of a newly developed instrument to assess students' perceptions of autonomy support was confirmed by confirmatory factor analyses. The relations between the factors were differentially investigated by hierarchical linear regression analyses and structural equation modelling.

It can be shown that students' perceived autonomy support has a positive effect on control and intrinsic valence appraisals. Different constellations of appraisals mediate the effect of autonomy support on achievement emotions. While valence seem to be a strong mediator in the case of positive emotions, control is a mediator of the effects on negative emotions. Nurturing self-determination seems to have stronger impact on students' emotions than fostering self-organization. Overall, autonomy support seem to promote positive emotions more than decrease negative emotions. Practical implications and methodical limitations are being discussed.